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Looking south on the main aisle of the Coliseum at the Chicago Automobile Show, which opened last Saturday afternoon

Chicago Show—America's Greatest

More Cars and Accessories on Exhibition Than Ever Before Attendance on First Day 15 Per Cent. Greater Than Last Year

CHICAGO, ILL., Jan. 26.—The motor mart of the middle west as exemplified by the fourteenth annual Chicago show, operated this year by the National Automobile Chamber of Commerce, Samuel A. Miles, manager, is the greatest of any promoted by that versatile gentleman, which is saying a great deal. More cars are being shown, the display of accessories is more varied than ever before, and the public interest in automobiles is at its zenith.

Attendance 15 Per Cent. Over Last Year

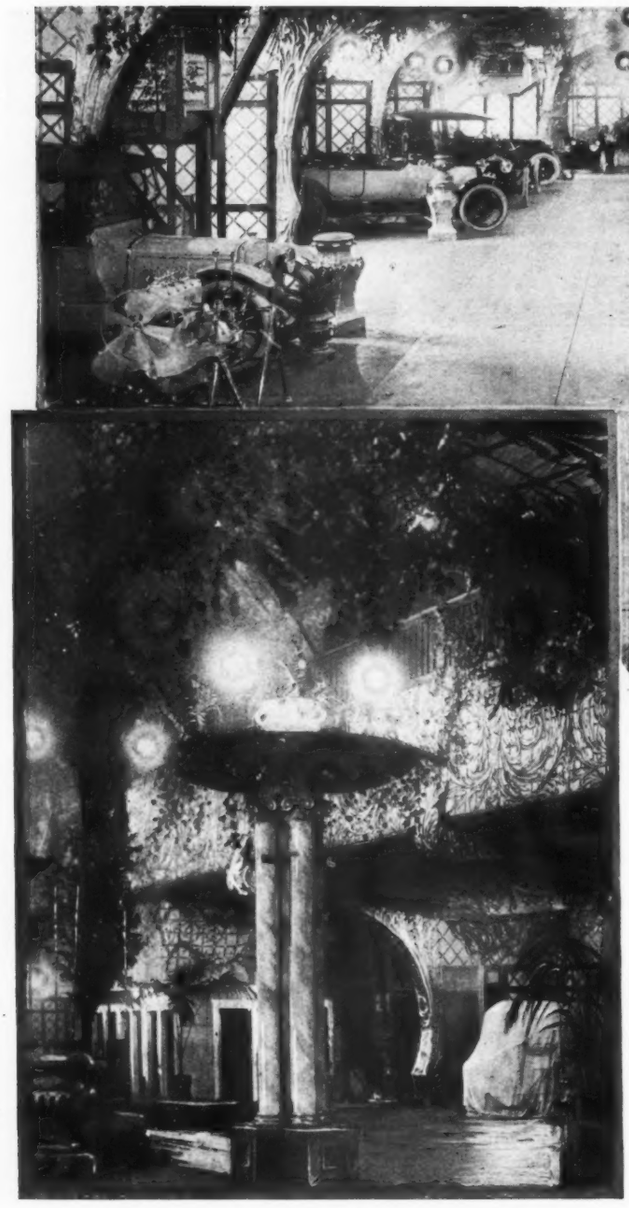
The show opened Saturday afternoon according to schedule and the box office count that night surprised even the most enthusiastic, for the receipts showed that the attendance on the opening day was 15 per cent. greater than last year, and Chicago always has been noted for the crowd it brings out for the getaway. Tonight the fast pace is being kept up, and if the report at the end of the week does not tell of a broken record it will be because of some unusual occurrence.

Chicago has had many magnificent shows in the past, but, in the opinion of the critics, there has been none that can compare with the present magnificent display, both from an artistic viewpoint as well as from that of size. Miles has added considerably to his floor space, and while he has not been able to squeeze in any more makes of cars, he has given the accessory people more room in the galleries, until now the floorspace is about the same as that of Grand Central Palace, New York.

Exhibits Cover 120,000 Square Feet

By extending the north and south ends of the Coliseum gallery into the arena he has been able to add 5,000 square feet and also to put two aisles at the end where there has been but one heretofore. With this addition the Chicago show has about 120,000 square feet of floorspace. The accessory booths in the Coliseum gallery also have been increased in depth from 11 to 17 feet by placing the aisles on the inside instead of the outside of the circle as heretofore. By inside is meant nearest the railing. Now the spectators have the big arena of the main floor on one side and the accessory booths on the other, whereas formerly they were between the booths and the outside walls and had to dodge the big iron girders that support the roof.

There has been no change in the general layout of the show itself. The Coliseum, Coliseum Annex, using the main floor for cars, the basement for cars and accessories, and the second floor mainly for accessories; the Greer building, formerly known as the Wilson, and the First Regiment Armory, still remain in the show group. The Greer building was added at the last moment after Clyde P. Warner and Erwin Greer had started to stage a cyclecar exhibit there. This gave Miles con-



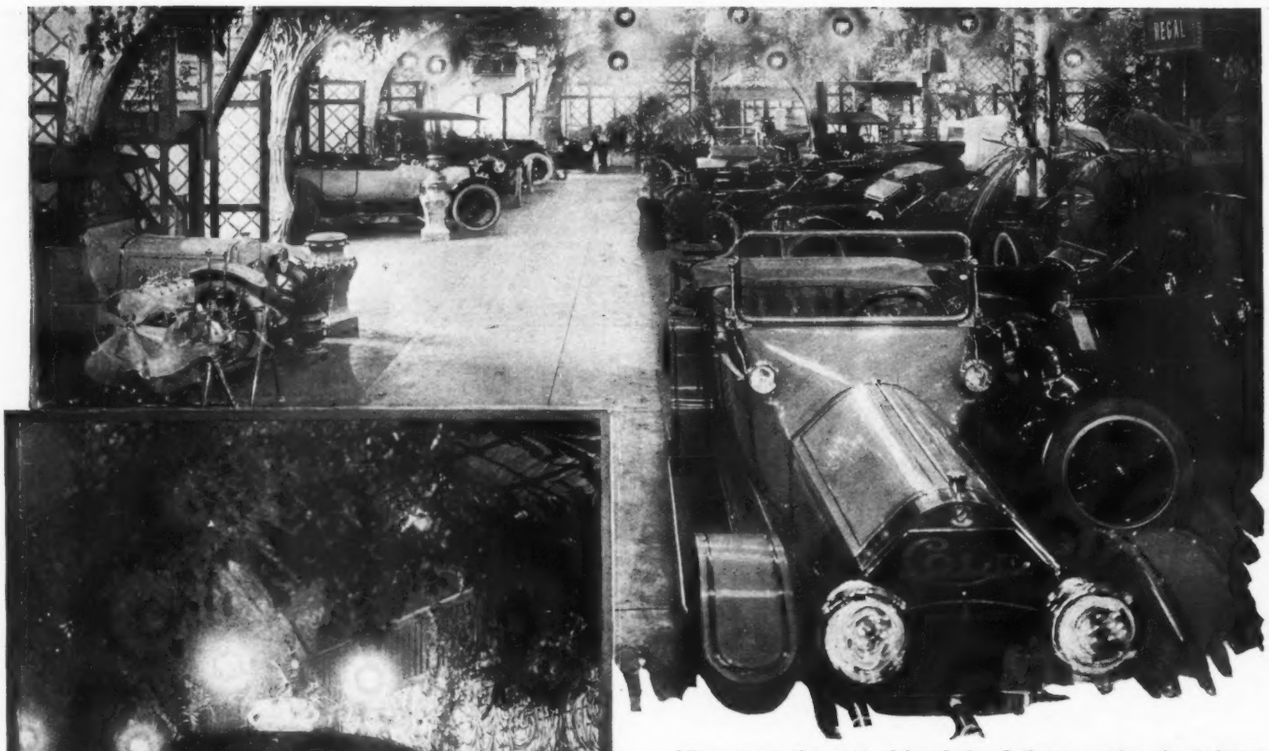
One of the pillar flower pot decoration schemes on the main floor of the Coliseum and Armory

siderably more space, which he sadly needed. The same means of communication between the Wabash avenue buildings and the Armory are retained, the spectators being obliged to use the alley to pass from one to the other.

Giant Conservatory Decoration Scheme

The decorative scheme is that of a giant conservatory, and the decorations cost in the neighborhood of $25,000. It is in the Coliseum that Miles has been able to get the most artistic effects. Trees and flowers abound on all sides, while the great roof is a mass of black and gold that adds materially to the beauty of the scene. The interior, too, is brilliantly lighted by means of huge incandescents which throw out a glare that might be expected to blind people, but which is considerably subdued by the general character of the decorations.

As before, the Coliseum is divided into three aisles running north and south, and one at each end of the building. Separating the spaces is a set of decorations running north and south, which are the same in all cases. In fact, they represent the decorative scheme. This unit starts with a huge flower pot,



View down the east aisle of the Coliseum under the balcony, showing how compactly the exhibits are arranged to provide a wide aisle

made up of four supporting pillars, surmounted by a big bowl within which are concealed more incandescents, which reflect light to the beautiful ceiling. This flower pot is decorated with twining vines and flowers, while peeping above the light bowl is an artistic urn, containing more flowers. Then there is a short panel of fencing, broken by a tall poplar tree, to which have been stuck beech sprays imported from Austria and made fireproof. Then there is another panel to the next flower pot.

One hardly appreciates the vast amount of work put on the ceiling. The casual observer looks up and sees a roof of black and gold criss-crossed with black lines and occasionally embellished by huge scrolls, but he does not know that work on this big ceiling started last July and was not finished until the latter part of last week. Last summer the artist visited Miles at his Christmas Cove farm in Maine, and then the idea was conceived and planned out. Then the artist returned to Chicago, and for 6 months he labored at his task.

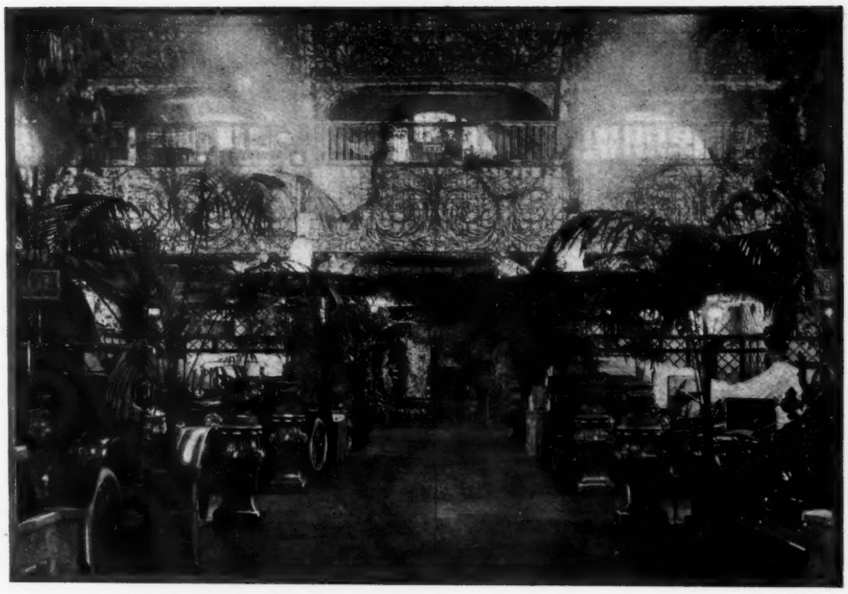
The Armory has the same general idea in the way of decorations, modified, of course, to meet the conditions of the smaller building. The Armory display is particularly interesting because here are grouped the electric car manufacturers, who were given the privilege of allotting their own space, so all of them are in one compact group, a larger display than was made at New York.

Although in the main the Chicago show is much like the eastern division, it really gives even greater opportunity for summing up the predominating features of the motor car production world, for the observer has also the facts gained at the previous exhibition for comparison with that which he sees here. The Chicago show may be regarded as a better average criterion of the tendencies of the year than any other, for it brings together many middle western makers who do not make the journey to the farther eastern affair.

Progress in Body Designing

The single-compartment closed car is greatly in favor this year. In this type there are no partitions between driver and passenger compartments, and sociability is much greater in that

the driver and his companion are not isolated from the rest of the occupants. This type of car is receiving much favor from the class of owner who wishes to drive his own car or who does not object to having a chauffeur in with the rest of the car's occupants. Such interior arrangements usually give the machine of this type the name of sedan, and even this suggests the possibilities of sociability and comfort. In many cases the seats within are individual, some of them pivoting so that the occupant can turn in any direction desired. There is a logical reason for the gain in this class of machine, for very often the owner is the driver, even though he may have a long pocketbook and be able to own higher-priced limousines if he so desires. The limousine, the berline and the landaulet all have their uses, and will always hold their own in their particular fields, but the single compartments affair is a logical and practical development especially for winter use by the average owner. Some striking examples of this single compartment design are seen among which might be mentioned the new pathfinder, which has room for six passengers, two on the rear seat, which is narrower than in the average type; two in the auxiliary seats and two forward. The Winton sedan is also a well-planned affair and leaves nothing to be desired as far as "sociability seating" is concerned. Peerless has gone so far as to design a four-passenger car of this type which has individual chairs instead of fixed cushion seats. These may be moved around with only the extent of the body interior as limits The driver's seat, of course, is stationary as a necessity. To prevent the chairs from bobbing around due to road shocks, they are properly weighted. Hudson, Chalmers, Cadillac, Kisselkar, Paige-Detroit, Studebaker, Cartercar, Packard, Apperson, Franklin and many others have brought out cars of this sedan type.



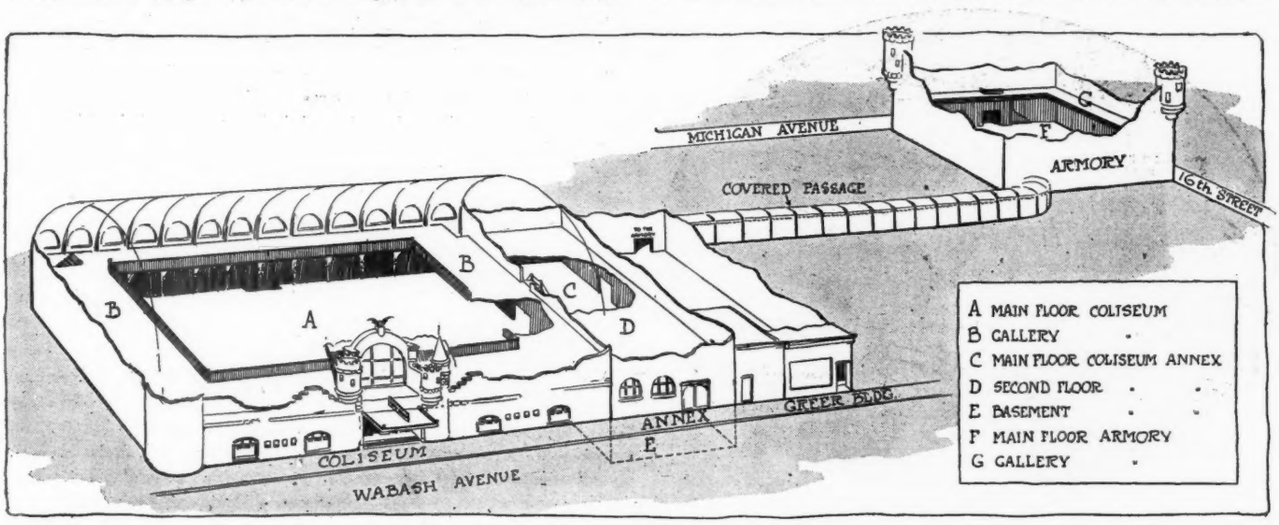
View from the main entrance of the Coliseum, giving an idea of the elaborate and imposing decorative effect

Development of the seating within roadsters is having its fling this year, too. Individual seating of a new type is displayed in the Lexington. The seats are provided with a tilting mechanism so that by simply turning hand wheels in front of them and below the cushion the back may be set at any angle within a considerable range. The driver may wish to sit erect while his companion can be in a semi-reclining position if he wishes. The idea of seating the driver somewhat forward of the other passenger in the roadsters has also been given more consideration this year, the Franklin being a good example of this. The cushion of the driver's seat sets forward about 6 inches from the other. In addition, there is a small auxiliary seat opposite in front of the seat next to the driver, which makes it a very nice arrangement when it is necessary to take three people.

Convertible roadsters, which have been generally given the high-sounding name of cabriolets, are here to stay, filling as they do the demand for a vehicle which will be proof against the elements when closed and which when opened up differs very little from the conventional roadster.

Cyclecar is Receiving Great Attention

If possible the cyclecar is receiving more attention at the Chicago show than it was accorded in New York. There are two names in the Chicago show buildings which were not in New York, these being the Coey Junior and the Mercury. The former is a Chicago product, having all the earmarks of a cyclecar on a 42-inch tread and belt drive and friction transmission.



Skeleton diagram of the buildings housing the Chicago show: the Coliseum, the Coliseum Annex, the Greer building (formerly the Wilson building), and the First Regiment Armory. Note covered passage to the Armory

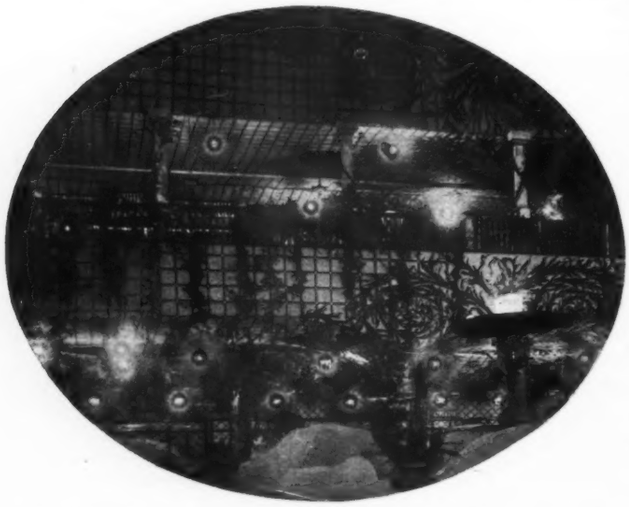
To the left—A view of the accessory space at the north end of the Coliseum gallery. The booths in this section were increased in depth from 11 to 17 feet by placing the aisle on the inside, instead of outside of the circle, as heretofore, that is, nearest the railing. Now the spectators have the big arena of the main floor on one side and the accessory booths on the other, whereas formerly they were between the booths and the outside walls and had to dodge the big iron girders supporting the roof

To the right—A view of some of the accessory exhibits on the second floor of the Coliseum Annex, looking east. Although most of the second floor of the Annex was devoted to accessories, this was not entirely the case. A car exhibit may be seen in the background. That part of the exhibition space which is shown herewith is largely filled with displays of tires and tire accessories, although there are several other exhibits

The type of seating is side-by-side. In the Mercury the same drive features are incorporated, but the tread is 36 and the seating tandem. As at New York, there are a number of makes of the little vehicles to be seen on Michigan avenue in front of the show buildings. The Woods, Dayton, Flagler and Steco are receiving all comers from this advantageous location. It is rather surprising to note that several makers of cyclecars who were scheduled to exhibit did not appear for the reason that their outputs have been entirely sold and they are not out for additional business at this time.

Four Cars Not at New York Show

The Chicago show always brings out several makes of cars which do not come to New York. This year the roster contains the Lomax, Herff-Brooks, Howard and Lexington, which, besides exhibiting only in Chicago, are new names in the industry. The first of these is a four-cylinder type, while the Herff-Brooks appears in both four and six-cylinder design, and is built by the corporation of this name in Indianapolis which also has the selling of the Marathon cars. The Lexington-Howard Co., Connersville, Ind., calls its sixes Howards, while its fours are Lexingtons.



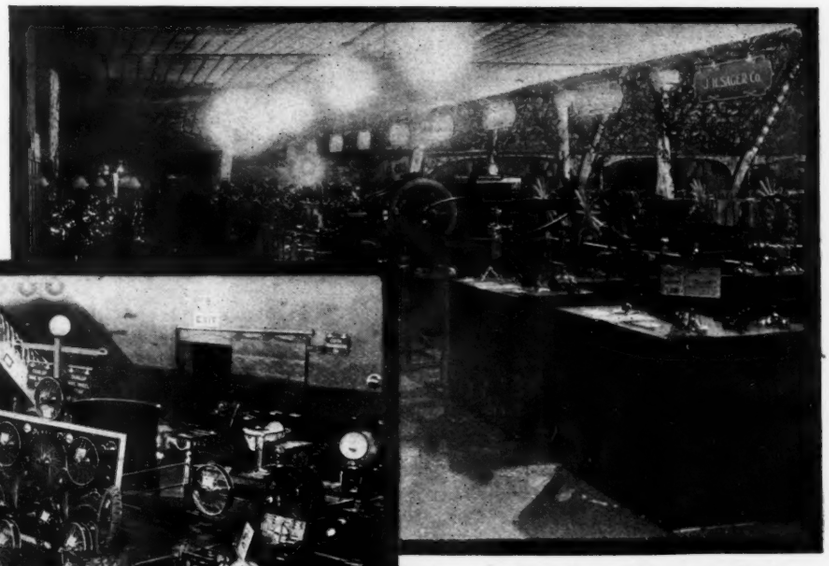
A part of the walls and ceiling, giving an idea of the elaborate character of the decoration which was months in preparation

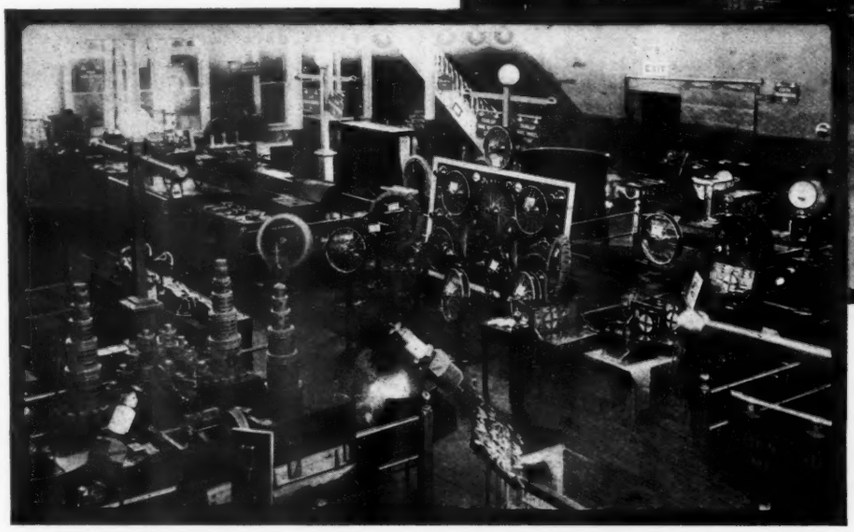
Among the electric makes there are a number of new models shown by makers who have established reputations for high-class vehicles of this type. Excellence of body finish, the acme of comfort and convenience within, and the further increasing of the chassis efficiency so as to get added mileage on each battery charge tell the story of the development of the electric, and an inspection of the several makes found at the shows brings this out forcibly. Argo, Baker, Borland-Grannis, Detroit, Broc, Century, Chicago, Columbus, Ohio, Rauch & Lang, Standard and Woods is a representative list of electric makers of which the Chicago show boasts. This exhibition brought out more of the electric makes than did the eastern affair this year, and is significant of the fact that manufacturers of these cars realize the great field the middle west is beginning to be for their product. The far-sighted show management has very properly grouped together all of the electrics in the armory, so that the electric prospect may very readily compare all types. The Century, however, which came in too late for proper classification, has space in the Wilson building adjoining the Coliseum.

Accessory Exhibits Big and Varied

Making the rounds of the accessory exhibits this year is more of an education than ever this year, and brings out forcibly how wide and varied are the classes of apparatus applicable to the motor car of today. In the older accessories which have followed the shows from year to year the veteran visitor can see much development, probably more so during the 12 months just past than during any corresponding previous period. Carbureters, affording nearly perfect adjustment of mixture, are con-

To the right—Another view of the enlarged accessory space, this time showing the south end of the Coliseum gallery. This section was partly devoted to the display of wheels, springs, shock absorbers, rims, lamps, etc. The illustration gives a particularly clear idea of how greatly the available space for booths was increased by the plan of bringing the aisle out to the railing, instead of placing the booths inside and the aisle near the outside walls





To the left—A view of the display of accessories on the second floor of the Coliseum Annex, looking west. An inspection of the booths shown in the illustration will serve to aid in the realization of the wide variety and completeness of the exhibits offered by the accessory departments of the Chicago show. So numerous and widely varied a collection of automobile accessories has never been shown before in the United States

spicuous, lighting fixtures leave nothing to be desired in the way of beauty of design and finish, electric starting, lighting and ignition equipment have seen great growtht and development, shock absorbing devices are more numerous, and devices to add to the comfort of the driver are in ever-varying profusion.

The Dunlop dual wire wheel stands out prominently as an entirely new development in its line. This wheel is designed to carry two pneumatics, and is for use of heavy limousines and other passenger cars of this type, as well as commercial vehicles.

Another new thing is the Stewart automatic thermal carbureter regulator which brings an entirely new thought into the construction of carbureters in that it is intended to keep the mixture as regards the ratio of air and gas in proper proportion to the heat of the engine. The details of this device are explained elsewhere, but the bringing out of the apparatus of this kind which will automatically give the correct mixture shows further possible use for fuel economizing and for the near perfection of mixing devices.

Speedometer with Speed Lock

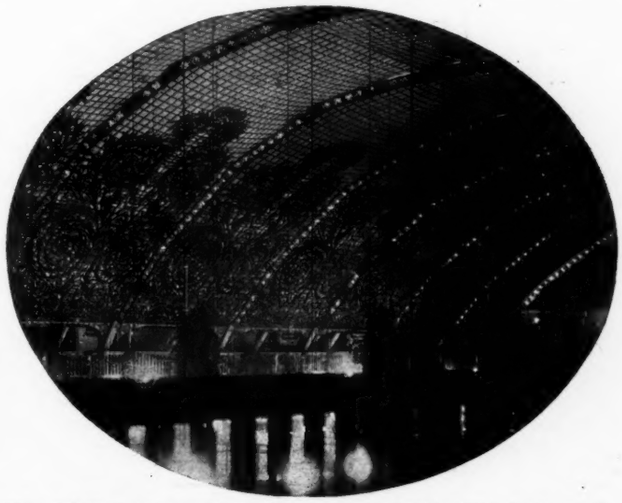
New in the speedometer field is the Hoffecker with which is combined the Evans speed lock. The lock portion is little larger than the small pilot lamp which is usually combined with speed-recording instruments and provides for the locking of the speed of the car at any maximum desired. That is, the indicator may be turned to say 15 miles an hour, and the apparatus locked. When the car speed reaches this amount as shown by the speed indicator, the ignition circuit is automatically cut out, stopping the motor until the speed has dropped to or below the set amount of 15 miles, when the current is again switched on automatically and the motor allowed to operate. Obviously, if the indicator is set at zero the ignition current is switched off and the car cannot be started, making the device an effective lock against operation of the car as well as a speed regulator. This attachment adds $15 to the cost of the speedometer.

Stromberg has used the national shows as a vehicle for placing before the public a new carbureter which has a much more accurate method of hand regulation of the mixture than heretofore and marks a new milestone in the progress of this firm.

Looking over the accessories in general it is evident that the Ford car is figuring prominently as a target for new devices. There are shock absorbers specially designed for Ford cars, Ford wire wheels, and no fewer than four specially-designed cranking devices for this make of car alone. One of these is an electric, one a mechanical, and two operate by compressed air. With Ford turning out each year close to 200,000 cars and with over half a million of them in use the development of special devices for Fords is not to be wondered at.

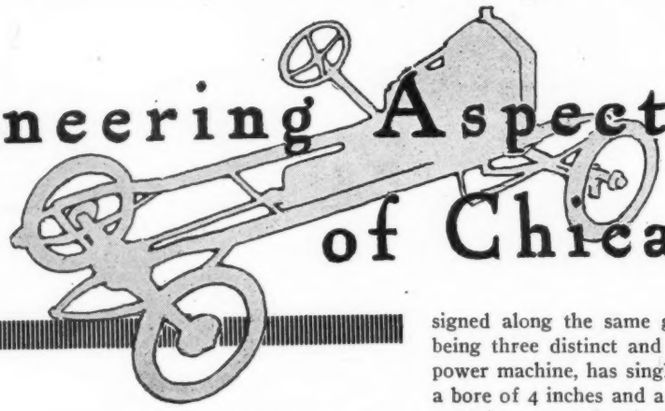
There is a marked increase in the number of types and makes of shock absorbing devices. The new ones are chiefly of the coil spring type, although auxiliary spring varieties which look very much like the car springs themselves and which are designed to be interposed over them to operate in much the same way, though in the reverse direction, are prevalent. At Chicago

(*Continued on page 322.*)



The detail work on the ceiling is wonderful. The task of its creation was begun last July and finished last week

Engineering Aspects of Chicago Show



The Features of the Show

¶ The Chicago show is featured by several new cars, many interesting body designs and numerous novelties in the accessory line. The Herff-Brooks is seen here for the fir t time. Two new non-poppet motors, the Charter and the Shaw, are displayed. Interesting bodies shown include: a Studebaker and White limousine; a coupelet body on a Chalmers chassis; a richly finished Chicago electric for Pope Pius; a bare aluminum body on the Woods electric, and there are a host of others. Among the accessories, a thermostatic device made by the Stewart-Warner company and a dual wire wheel by the Dunlop are especially noteworthy, but many other very interesting accessories are to be seen.

CHICAGO'S motor car exhibition is featured by a number of new designs and particularly by a wealth of new accessories which either have been developed within the last two weeks, since the New York exhibition, or whose makers are making their public appearance of the year at the windy city. The list of car makers who are at the Chicago exhibition but were not at the New York is given on other pages and their products are creating interest from the fact that this marks the first appearance of their new models.

Among others who have met the public gaze at New York, the only novelties are in the line of new body types. There are a number of special bodies shown here for the first time, chiefly among the inclosed cars. Limousines and coupés of special construction are numerous and one firm is showing a convertible roadster coupé.

In the matter of accessories, there is a wealth of novelties, most of the new things being either in the way of carburetion devices, cranking arrangements, and shock absorbers. A feature of the accessory department which is creating much comment is the number of special accessories devoted to the Ford owner. He is offered two or three different types of cranking devices, numerous styles of shock absorbers, and special ignition, and carbureter outfits.

One novelty is the McFarlan car which is equipped with a pneumatic gearshift which adds one to the list of automatically gear-changed cars, making five in all on the 1914 market. There are a number of cyclecars which make their first public appearance at Chicago and these are treated in detail on other pages.

Herff-Brooks—Has Four and Six

The Herff-Brooks car made in both four-cylinder and six-cylinder types has its début at the Chicago show. The maker is the Herff-Brooks Corp., Indianapolis, Ind. Both models are designed along the same general lines, motor, clutch and gearset being three distinct and separate units. The six is a 48 horsepower machine, has singly cast cylinders of the L-head type with a bore of 4 inches and a stroke of 4 1-2. The crankshaft is supported on seven bearings and the valves are completely inclosed. Lubrication is by the splash system incorporating a gear pump for circulating the oil with sight feed on the dash. Dual ignition and pump circulation of the cooling water are also featured.

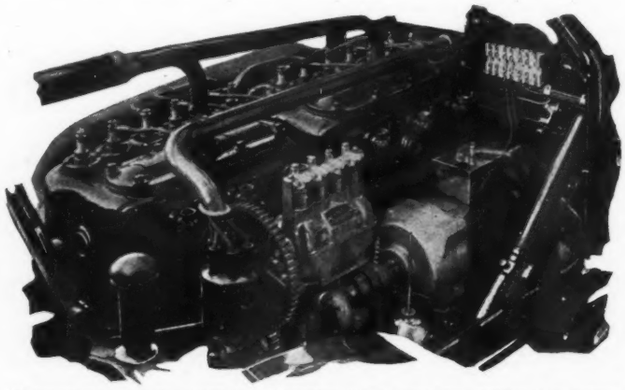
The clutch is a leather faced cone type, the gearset has three forward speeds, and back of it is a torsion tube inclosing the propeller shaft which conveys the power to a three-quarter floating rear axle.

Two sets of internal expanding brakes operate on the rear wheels, while the rear springs are three-quarter elliptic and are of sufficient length to give very easy riding. Drive is on the right, control in the center. Both five-passenger touring and two-passenger roadster bodies are offered, being of the latest flush-sided type with sloping cowl dashes, wide doors with up-to-date mud guards following closely the lines of the wheels. The wheelbase of the six is 124 inches, and the tires 34 by 4. Complete electric equipment for cranking and lighting is included in the list price of $1,375.

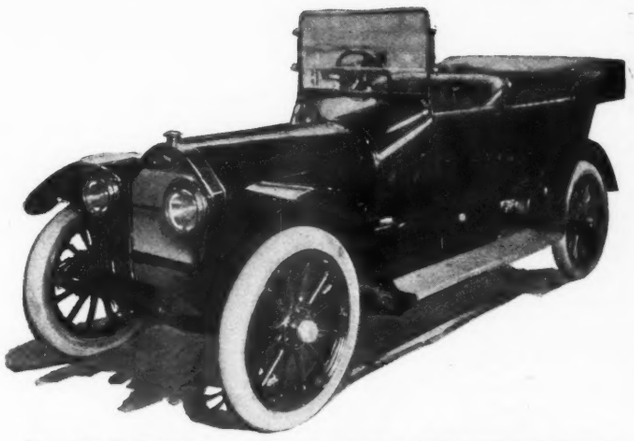
The four-cylinder model of 38 horsepower also has an L-head motor but the cylinders are block cast, 4 1-8 by 5 inches. The crankshaft is carried on five bearings and in all other respects this power plant has the same features as its larger brother. Chassis details of this model are the same as those of the six, though, of course, on a somewhat smaller scale, the wheelbase being 116 inches. With equipment similar to the six, this car is to sell for $275 less.

Lexington and Howard—Fours and Sixes Shown

The Lexington-Howard Co., Connersville, Ind., is an exhibitor at the Chicago show with fours and sixes. The former are offered under the Lexington name, while the latter are known as Howard cars. The four-cylinder model has a 4 by 5 L-head unit power plant which is of up-to-date design. The only unusual feature of this is the incorporation of the Moore exhaust wherein the waste gases from two of the cylinders are carried away in a separate branch of the exhaust manifold from that which takes care of the other two cylinders. The motor is cooled by cen-



Howard six motor, showing Atwater-Kent system, power tire pump mounting and drive, and lighting generator



New Herff-Brooks car with six-cylinder, 48-horsepower motor

trifugal pump and cellular radiator, has a Schebler carbureter and Atwater-Kent ignition using a Willard storage battery. A silent-chain driven electric starter and generator is used. Engine drive is taken by a cone clutch to a three-speed gearset. The power is conveyed to the propeller shaft inclosed in the conventional type of torque tube. The rear axle is three-quarter floating and carries 14 by 1 3-4 inch internal brakes. The drive is on the left side, control in the center, and the wheelbase is 114 inches. A five-passenger touring body only is listed which is in line with present day ideas of body designers. With full equipment, the price is $1,335.

The Howard six which is listed at $2,375 makes use of a Continental 4 1-8 by 5 1-4 L-head motor, the cylinders cast in threes, and which incorporates the unit power plant feature. Ignition is by two separate systems, one the Atwater-Kent with automatic spark advance and the other a Bosch high-tension magneto type. Starting and lighting are taken care of by the Howard-Jesco electric outfit, cranking motor being driven by silent chain. A Willard storage battery is part of the electric apparatus. Like the four, this car has three-speed gearset, cone clutch, and drive to the rear through a torsion tube. The rear axle is a Timken floating type, and brakes are external and internal 2 1-2 by 15 1-2. Left drive, center control are featured, and roadster and touring bodies of the latest type are fitted to the 130-inch wheelbase.

Howard Makes Own Body

The six-cylinder, seven-passenger, Howard touring car is equipped with a body made entirely in the Howard shops. It is finished in black throughout and has a number of features which will appeal to the buyer. The small compact instrument board is used, large flat control pedals and a new type of accelerator, which is in the form of a ball protruding through the footboards.

There are three compartments for carrying tools, one in the tonneau, one in the side of the cowl, and another in the rear of the car. The holder for the extra tire is made integral with the frame, a new Howard construction. One mechanical feature worthy of note is the multiple exhaust pipe, which has two separate compartments, one taking the exhaust from the front three cylinders and the other from the rear three.

Lexington Has Adjustable Seats

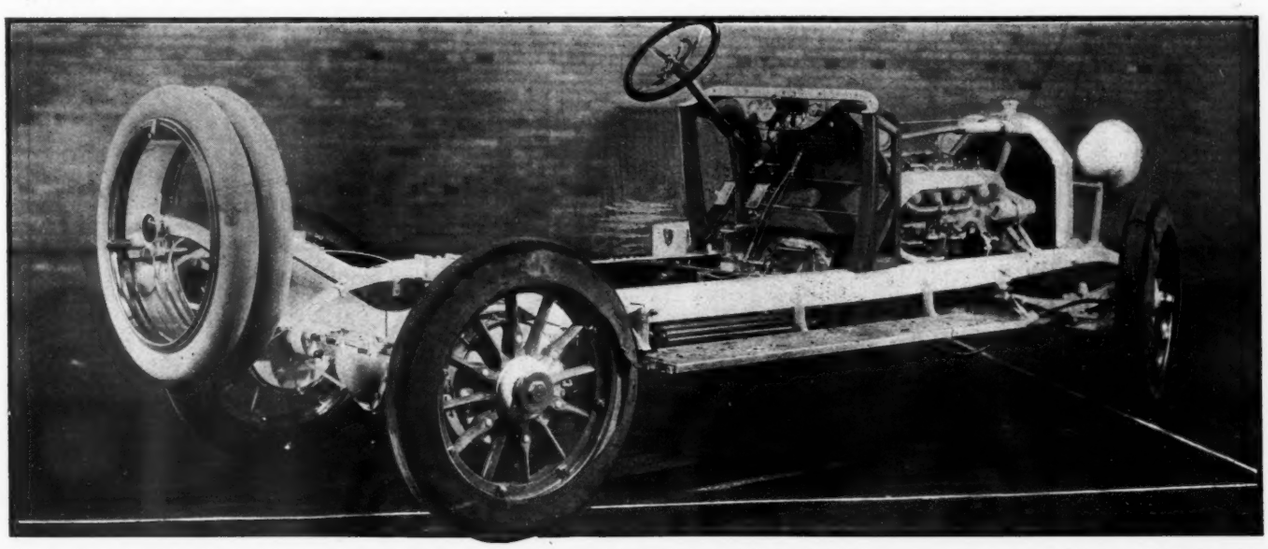
A roadster finished in pink with white striping was an unusual attraction to be seen at the Lexington-Howard booth. The feature of this four-cylinder car is the adjustable seats. A hand wheel under each seat controls the height and also the angularity of the back. The seats are adjustable within a wide range even while the person is sitting. The roadster is finished in Spanish leather. As is characteristic of the Howard, another product of this company, the extra tire carrier is made integral with the frame. A large luggage carrying compartment provided in the rear deck. The top is of khaki and is fitted with Jiffy curtains.

Studebaker Four Special Limousine

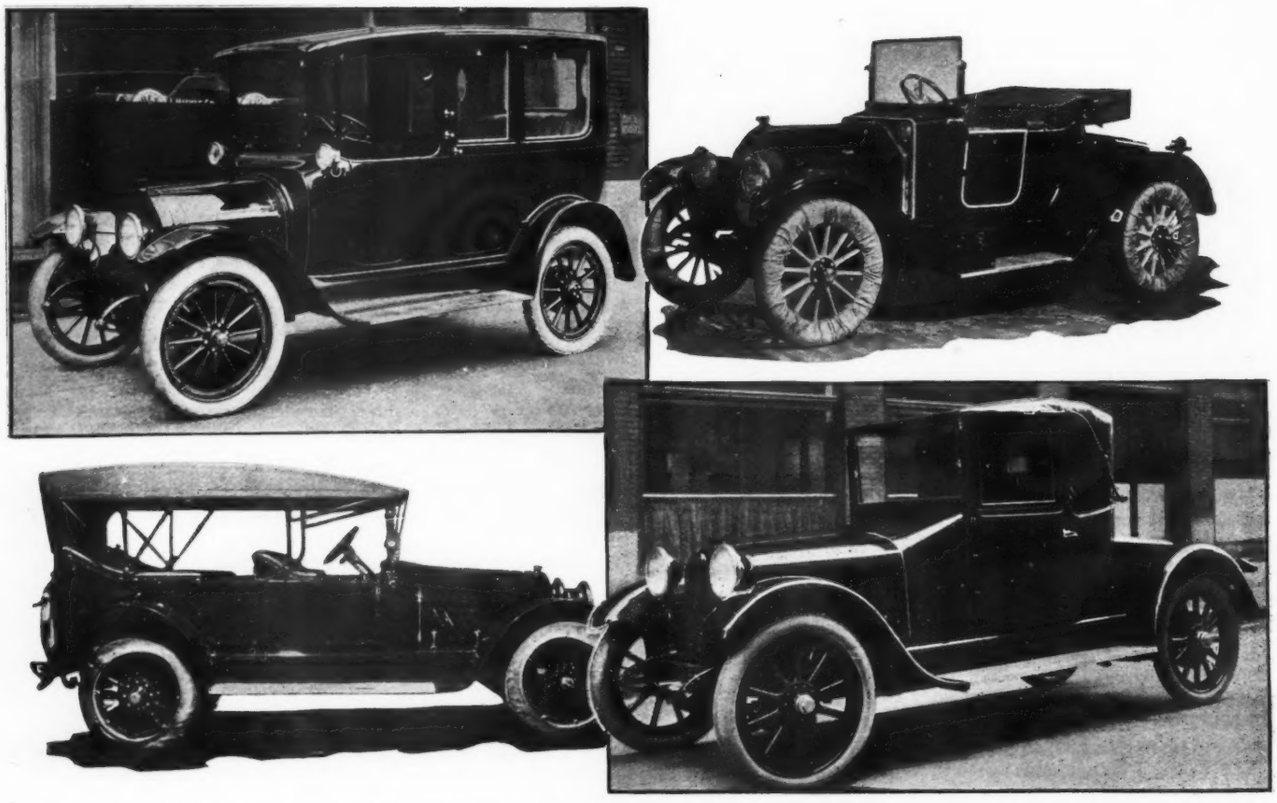
One of the neatest bodies fitted to the lighter cars at the show is the special limousine body on one of the Studebaker Four chassis. This body is a special job built by Markle and has a number of features of interest. It is arranged for six people, the interior seating three on a broad single seat at the rear, while a folding seat accommodates a fourth. Besides the driver's seat there is an auxiliary seat for one person which may be folded up to provide room for luggage. As will be seen from the illustration the driver's seat is set back further than that at his right, so that the driver has considerably more elbow room than ordinarily. The door on the left side is much narrower than that on the right side, the latter being exceptionally wide and this extra width being provided for by the shortened knee room of the other seat. There are a number of interesting conveniences, including a telephone and toilet case.

McFarlan Has Pneumatic Shift

The Gray pneumatic gearshift is featured on the McFarlan chassis, a seven-passenger touring car of light brown color and with clean lines throughout. The hood being extremely long, the McFarlan company has fitted three fasteners, so as to prevent rattling. Another innovation is the attachment of the horn to the right lamp bracket. The battery box is carried under the front



Howard six chassis, featuring a unit power plant and left drive with central control. Notice novel tire carrier which is integral with the frame

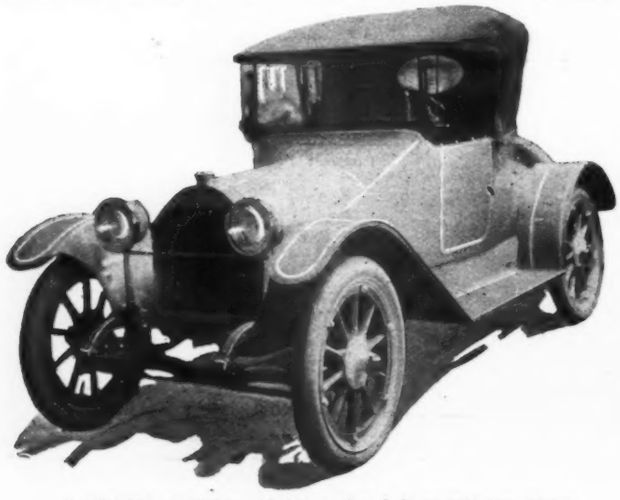


Top, left—Studebaker six-passenger limousine fitted to four-cylinder chassis. Bottom, left—Six-cylinder McFarlan equipped with Gray pneumatic gearshift. Top, right—Crow roadster with Ideal spring wheels. Bottom, right—Chalmers six coupelet—a combination roadster and coupe. This is intended for the man who wants an all-weather two-passenger car.

seat and the tires in the rear. The chassis is the only one made by the company and the motor six-cylinders, cast in block.

White Has New Limousine

A new seven-passenger limousine in green and black was a characteristic exhibit at the White booth. All interest was centered about the body, the chassis being the regular six-cylinder White. The rear of the limousine is finished in tan whipcord, while the front compartment is of black leather. The color scheme has been carried to the limit, even the bone door handles in the inside matching the upholstering. The window separating the front compartment from the rear is in three parts: A large one in the center may be dropped out of sight, while the two smaller ones in the side fold outward, thus when the windows are not in position there is little evidence of the car having two compartments. All the windows drop but the one in the rear. The car is fitted with Pullman lights in the cowl, has an electric telephone and the conventional limousine appurtenances.



Lexington roadster. It has a 4 x 5 four-cylinder motor

Crow-Elkhart New Roadster

A new four-cylinder roadster, finished in black and white moulding is the attraction at the Crow-Elkhart display. This car is fitted with Ideal spring wheels. The new Crow carries the battery box on the left running board, has closed dash lamps, a new design of headlight and has an extremely large luggage carrying space in the rear. This car shows all the latest improvements of the Crow line, being fitted with an instrument board, the feature of which is the attachment of the clock. This is so fastened that pressure on a small button makes it removable for winding or inspection purposes.

Chalmers Coupelet

The latest of the body types in the Chalmers quota is a new combination roadster and coupé body, which is called the coupelet. This is fitted to the new Chalmers six chassis and is intended for the man who wants an all-weather vehicle of two-passenger capacity. With top up the car is a completely inclosed coupé, with the upper half of the doors of glass, but with the top folded back and the windows dropped it becomes a roadster of speedy apearance.

Chicago Electric for Pope Pius

Pope Pius will receive, within the next month, an electric pleasure car as a gift from more than a score of prominent Chicagoans. This most modern form of equipage will be used by the head of the Catholic Church in his drives about the Vatican gardens, supplanting the wheel chairs and state carriages that for centuries have been used by his predecessors. The Papal car is a Chicago Electric, and is one of the features of the show.

The car is the regular Model 143, a five-passenger electric limousine, driven from the front seat. The Papal coat-of-arms, embossed in red, decorates the two doors. The seats are richly and deeply upholstered with imported Bedford cloth, which is covered with cream Bedford cord, bound in gold, with the Papal crest in embroidered gold on the back of the seats.

Borland Has Many Body Features

The Borland-Grannis Co., now a member of the American Electric Car Co., has built a number of bodies with many new features. In the rear-drive brougham the pedals have been rounded so that the operator may easily push them with the heel of his shoe instead of the sole. This has been found to make control easier for women. Two lights are used in the body, the bulbs being of frosted glass. The Borland five-passenger limousine is another interesting exhibit. This car appears very much like a gasoline car, with its long, sloping hood and driver in a separate compartment outside. The limousine body accommodates three people in the rear seat and two on separate seats.

Woods with Bare Aluminum Body

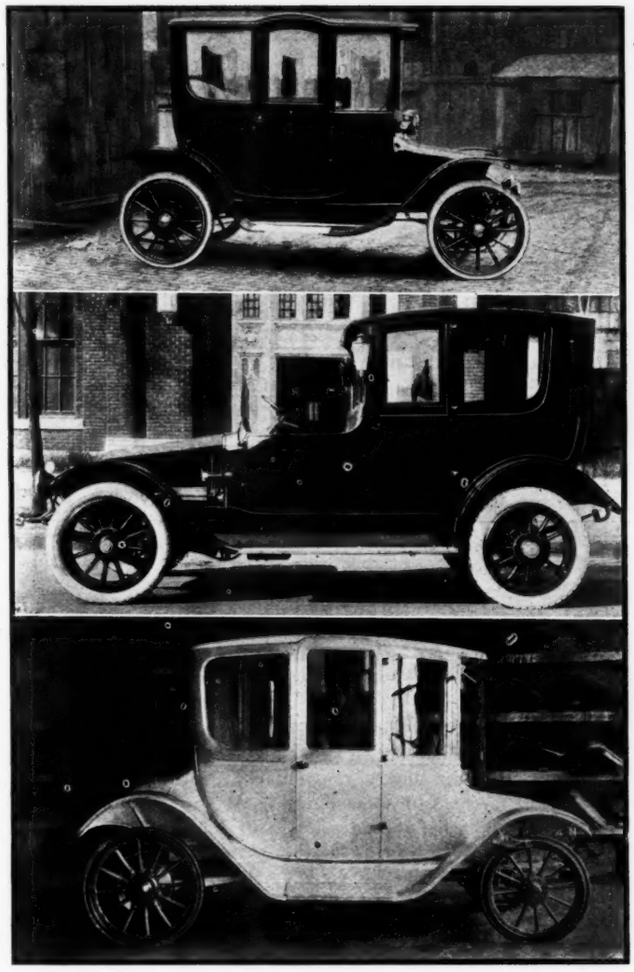
A new coupé with a bare polished aluminum body is shown by the Woods company. This car is a five-passenger type with one revolving seat, and has left drive and a number of detailed body refinements. A very convenient position has been found for the clock, which is placed near the roof and forward of the driver instead of on the floor as is customary. The windows are operated by handles and may be placed in any position without dropping. This is a single pedal car with the batteries carried forward and aft. The side and headlights are formed in the body paneling in a very neat way. Though the velvet finish of this body makes a very pleasing effect, the maker shows it more to bring out the construction of the bodies than as a completed car.

Argo Has Four Drive Coupé

A new four-drive, wheel steer Argo coupé with detailed improvements is shown at the Argo booth at the Chicago show. The car is finished in Brewster green with gold striping and a general outer view shows no changes at a glance. However, more moulding has been added and the body lines have been given a more graceful appearance. The interior accommodates five passengers, three on the rear seat, one on the revolving chair, forward, and the driver on a separate stationary chair. All the windows in Argo electrics may be dropped. The interior is finished in whipcord and the equipment includes a Gross toilet set and smoking layout. Gray cravenetted covers protect the seats. The control pedals are rounded so as to make driving easier for the women.

Broc Has Lighting Features

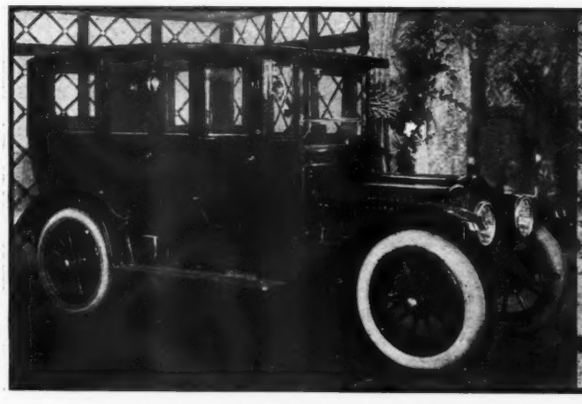
One of the American Electric Co's. car products, the Broc, shows an interesting rear drive car with a number of detailed refinements. One innovation centers about the meters, these instead of being placed in a conventional position on the floor are fastened immediately below the roof and directly in front of the driver. A covered push button behind the control pedals operates a light which illuminates the meter scales. The car is a five-passenger type with one stationary seat in the corner, one seat for the driver and the long three-passenger seat in the rear.



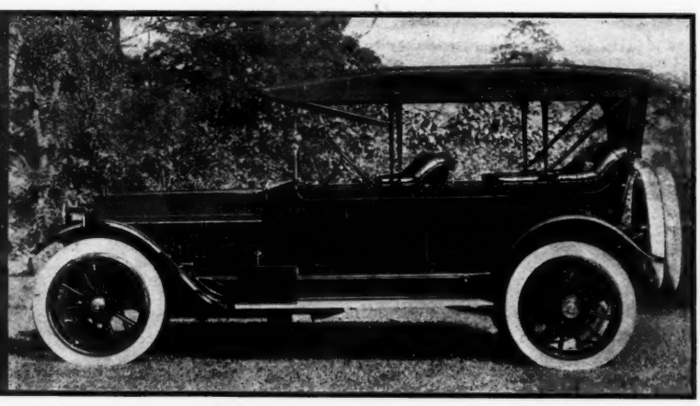
Top—Chicago electric fitted with special body for Pope Plus
Middle—Borland brougham following gasoline car body design
Bottom—Woods electric with a polished aluminum body

Maxwell Roadster Delivery Car

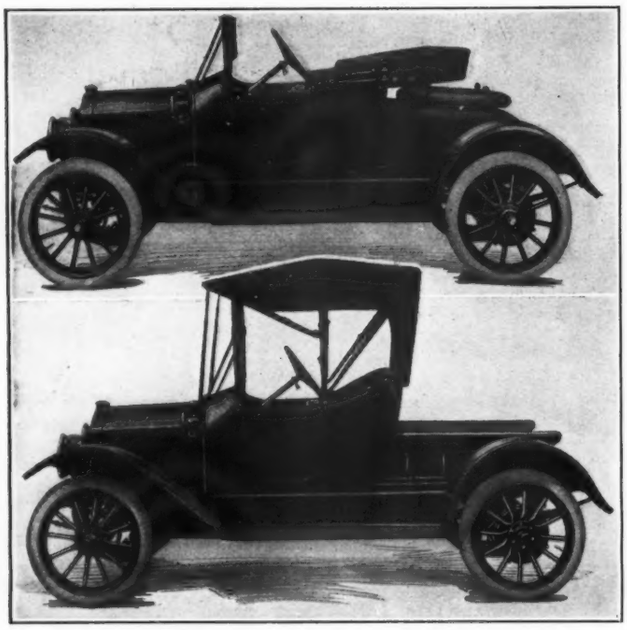
To produce a convertible car that could, on occasion, be transformed from a pleasure to a utility vehicle has been at the same



New White limousine fitted to six-cylinder chassis



Howard six, showing attractive body design



Maxwell roadster and delivery car. It is notable for the neat appearance of both body styles

time the ambition and the despair of designers. The problem of spring suspension has been one of the greatest difficulties. Another has been the almost impossibility of making a car that would look the part in either form.

Maxwell engineers offer a solution of the problem, the Maxwell convertible roadster-delivery car. This has a convertible body fitted to the four-25 chassis. By the simple process of removing the rear deck and attaching an express deck the car is converted into an ideal light service or depot car.

Stevens-Duryea Features Closed Car

A new seven-passenger, six-cylinder limousine finished in beaver brown, and black is the feature of the Stevens-Duryea exhibited at the Chicago Coliseum. The interior of the body is of beaver broadcloth in the rear, while the front is of black leather. A characteristic feature of the Stevens limousine is that everything, such as telephone, cigar lighter and so forth is in an individual pocket.

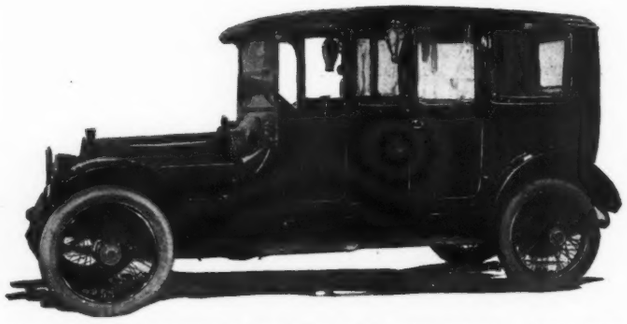
Great Western with Piston Valve Motor

The Great Western appears with a new six-passenger body on its four-cylinder chassis, whose power plant is the Carter piston-valve motor. The chassis is somewhat larger than that previously employed due to the use of the new motor. The wheelbase is 122 inches, the drive has been changed to the left side and central control is used, although the model exhibited does not have these features. The Carter motor is 3 3-4 by 5 3-4 inches in size and is said to develop 40 horsepower on the block at 3,300 revolutions per minute. This is the same power as is developed by the 4 1-4 by 5 1-2 poppet valve motor, which is supplied at a reduction of $500.

Moon Has Beautiful Lines

Beautiful lines outwardly and detailed refinements of the interior characterize the new 6-cylinder Moon coupé. Viewed at a distance the body outline forms almost a parabolic curve.

The driver may enter from either side and when the door is opened an exquisite blue interior is seen, which accommodates three persons. The two seats in the rear are slightly staggered, while one in the front, right corner is stationary and faces the other two. Behind one of the rear seats and on a level with the top of it is a small compartment for carrying tools. All the instruments including the pressure pump for the fuel feed are contained in a box in the lower left corner and within arms' reach of the driver. The parts to be manipulated are of course exposed.



Stevens-Duryea limousine equipped with wire wheels. Note that the top of the door is curved, yet the roof is straight

Mitchell Displays New Roadster

The Mitchell company is displaying a new four-cylinder roadster which is featured by the spacious body compartment. Three people can comfortably be accommodated and there is ample leg room for a 6-foot person. The dashlights are fastened to an extension of the instrument board. A long deck in the rear permits the carrying of luggage or an extra tire. Another characteristic of the Mitchell is the fact that the driver may enter from either side. The fuel feed is by pressure from a rear tank to a tank on the cowl. The filler neck of the latter is directly in the center of the instrument board.

New Kissel Touring Tonneau

The Kissel Motor Car Co. is exhibiting a handsome new body model at the Chicago show. It is a touring tonneau for four passengers, mounted on a 6-48 chassis. Instead of the conventional two-passenger seat in front, individual seats are provided with an aisle between, thus permitting passage to the rear without leaving the car.

Pathfinder Shows Six-Passenger Sedan

The feature of the Pathfinder exhibit is the six-passenger sedan mounted on a six-cylinder chassis. This body seats the passengers in rows of two, the rear seat being narrow, in fact the rear of the body is of such small dimensions that it may fit between the frame members. The body was designed for an owner who wishes to drive his own inclosed car. There are five lights in the body, two of them being of the Pullman type in each corner at the rear.

Reo Has Medium-Priced Coupé

A medium priced coupé was the attraction at the Reo exhibit. This car has facilties for three passengers, the extra seat being folded into the dash and when so folded gives the dash a flat, clean appearance, so that one would hardly know a collapsible seat was there. Furthermore the compartment holding the extra seat is spacious enough to accommodate a few tools. The entire dash, including the extra seat, is covered with black leather. All the windows in the Reo coupé may be opened and an unusual feature may be found in the method of controlling the door windows. Pressure on a lever protruding from a box lowering them while they are raised by straps. The outside of the box holding the lever is used for a match striker and a cigar holder. A person may enter from either side, and when once inside may seal both doors by turning a small knurled nut. A large carrying space is provided in the rear of the body, one side of the space being formed by the gasoline tank. Thus a removal of the luggage space cover exposes the compartment and the fuel tank. A chassis refinement to be found only on the Reo coupé and not on the rest of the line is the centralized control. A small cylinder just beneath the steering wheel and attached to the post contains the ignition switch, lighting switch, and carbureter control.

Charter Motor Makes Its Debut

Single Rotating Sleeve Covers and Uncovers Intake and Exhaust Ports

A NEW addition to the ranks of non-poppet valve motors is the Charter, exhibited for the first time by its inventor, J. A. Charter, who is operating under the name of the Charter Single Sleeve Motor Co., Chicago, Ill. The Charter has a single rotating sleeve which covers and uncovers the intake and exhaust ports, this sleeve being driven at one-quarter the speed of the crankshaft through gearing at its base. This is the first non-poppet valve motor seen in America using the rotating sleeve although there has been one example of it in France, the C. L. C. introduced a few years ago. The Charter motor, however, differs basicly from the C. L. C. as will be seen later.

The Charter motor is made up of four cardinal parts, as follows: Outside there is the familiarly known cylinder casting containing the water jacketing space. Within this is positioned a fixed sleeve S, Fig. 2, which leaves sufficient space between it and the casting part to contain the rotating sleeve RS. Lastly, comes the piston which reciprocates within the fixed sleeve S. Mr. Charter claims basic patents on this construction in which the rotating member RS is located between the external casting and the fixed sleeve, S, which is a removable member. In contrast to this the C. L. C. rotating-sleeve motor has the piston operating within the rotary sleeve.

The method of rotating the sleeve consists of a spiral gear G, and a spiral pinion G1 carried on a longitudinal shaft parallel to the crankshaft and driven by it. The rate of travel is one rotation of the sleeve RS to every four of the crankshaft. The sleeve is demountable from the gearing G, by means of square jaw clutches on the lower end of the sleeve which engage the corresponding clutches on the upper end of the gear. Because of this the sleeve is readily removable without disturbing the gear drive and these clutches are so proportioned that the sleeve must be in its correctly timed position before the clutches can be engaged.

The fixed sleeve S within which the piston operates is inserted into the cylinder casting from the top and anchored to it by four studs. The top of this sleeve is water jacketed and carries the spark plug. In this sleeve are two openings, or ports, marked A and B, the former serving as the intake opening and B as the exhaust. The regulation of the mixture entering and the exhaust escaping is controlled by two corresponding openings, or ports P, in the rotating sleeves, diametrically opposite each other. Each of these ports serves for intake and exhaust purposes and due to the slow rotation of the sleeve the ports alternate in this functioning, thus one port serves to uncover the exhaust and the intake in one cycle and in the next cycle the other port in the sleeve similarly performs these two functions. One port in the sleeve would suffice if the sleeve rotated at one-half the crankshaft speed, whereas rotating but one-quarter the crankshaft speed two ports are needed, the slower motion of the sleeve being preferable because it simplifies lubrication and gives the ports ample time to cool.

Both of the ports P, in the rotating sleeve, are of the same size, namely 3 inches high and measuring 15-16-inch on the circumference of the sleeve, this giving an area of 2 1-2 square inches.

Looking next at the two ports on the fixed sleeve S, the intake port A is 3 inches high and .62 or approximately 5-8-inch wide. The exhaust port B also 3 inches high, is .85 inch wide or very nearly 7-8 inch. When these dimensions are converted to area the intake port has an opening of 1.87 square inches in the fixed sleeve and the exhaust port 2.50 square inches.

Port Area Very Large

In order to appreciate the value of this increased port area, as compared with poppet valve types and some of the other sleeve valve designs, the timing must be taken into consideration, the intake valve remaining at its maximum opening for 28 degrees of crankshaft rotation and the exhaust valve remaining at its point of maximum opening for 8 degrees of crankshaft rotation.

Further, analysis of the timing will show that the intake valve takes 82 degrees to obtain its maximum opening, remains at its

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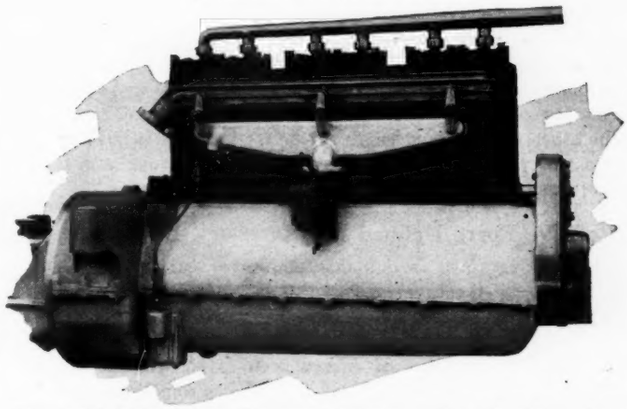

Fig. 1—Manifold side of the new Charter motor, showing clean design

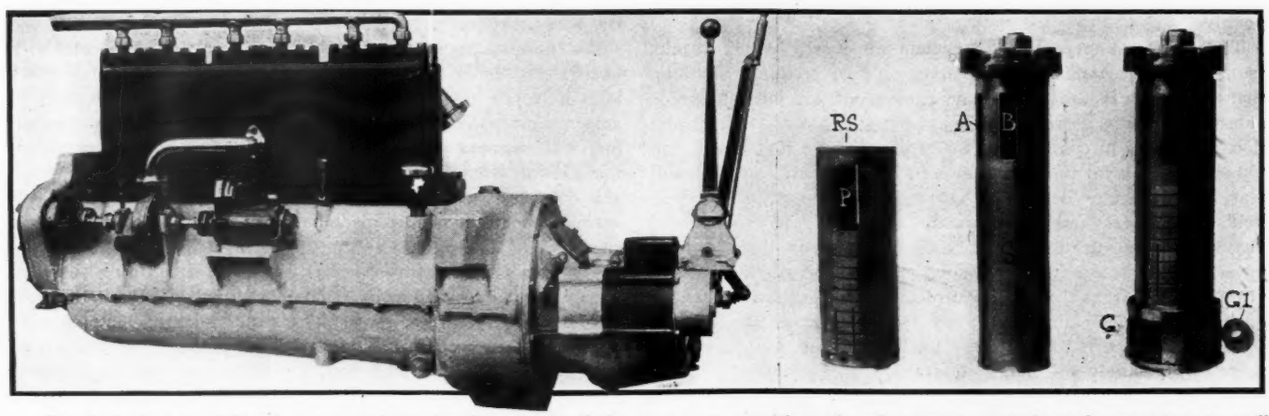

Fig. 2—Left side of Charter power plant showing clear cylinder face and mounting of water pump magneto and generator, as well as of control levers. At right is shown, in order, the rotating sleeve R S, having ports P, which register with ports A B in the fixed sleeve S, which is again shown at the extreme right mounted on the gearing G and G1, by which it is rotated

The Automobile Engineers' Forum

Claims That Electric Starter Is No More Positive Than the Air Type—Worm Drive Particularly Adapted for Electrics—Dampener for Spring Action Tends to Keep Vehicle Wheels on the Ground on Rough Roads

SANDY HOOK, CONN.—Editor THE AUTOMOBILE:—There is noticeable among the automobiling public and those who influence their opinion a growing use of the word "positive" in connection with many things about the motor car. A most notable example of this is its application to the electric starting motor. We hear the expression that the electric motor is the only device which starts the engine "positively." Now, this is grossly incorrect and misleading to the public who gather from the implication that a failure of the functioning of the apparatus is impossible. The original intent of the word was first applied to a now comparatively little used form of starter known as the gas starter which depended for successful operation on a number of nicely adjusted details being just right. Now, however, its original misapplication has resulted in a false conception by many people of the protracted practicability of electric starting.

There are very few things in engineering which are truly positive. For instance, when we say a part is positively locked we mean that a movement of this part will cause shearing, crushing, or other deformation of metal in surrounding or connecting parts. If we say that certain movements of a machine are positive we mean that action of one part produces movement of another part through the agency of a practically incompressible medium within the physical strength of that medium. Thus rotating one of two meshing gears will produce rotation of the other within the strength of the teeth. This is positive. But two pulleys belt-connected are not positive because mutual rotation depends on a slipping agency.

Positive Force Defined

A positive force is one that admits of certain flexibility in definition to the layman because exchange of energy is not clearly comprehended by the non-technical mind. The point in hand is that of producing mechanical movement positively by liberating other forms of energy such as electric current from a battery. To realize this we must move something with certainty when we press a button and if the machine in question does not move a part will be broken from the positive character of the starting force; otherwise the force applied is not positive.

The only ordinary single exchange of energy which results in a visible mechanical movement capable of crushing anything that resists it is the heating or cooling of an incompressible substance. Thus if we heat a mass of iron it will expand, and it is impossible to confine it in every direction so that it will not. On the other hand if held from contracting when cooled it will tear itself apart or deform in shape according to the way it is held. A similar action is familiar to all in the bursting of vessels of great strength when water is heated in them without a vent or air space for expansion. Water and all fluids differ from solids in that they will contract and leave a void space on cooling since they cannot pull apart from shrinkage like a metal.

Let us now turn to electricity and digest the statement that there is absolutely no direct manifestation of electricity which results in a "positive" mechanical movement. The first thought that will occur is that sending a heaving current through a bar of metal will expand it, but this is not a direct manifestation because the electricity liberates heat in the bar with a resultant action as stated above. We have then first changed the electricity into heat and used the heat to give us the expansion.

Electricity as applied and used for power purposes of all kinds without exception is a flexible or elastic medium similar to the stretching of rubber bands or the tendency of a piece of wood to get to the surface of water. In other words, you could turn all the electricity that is produced in New York City into a 1-horsepower motor and it would not go around if its armature was stuck tight. Of course, it would burn up at once, but would not start before this happened. The idea is that the action is not positive like the pulling together of heavy masonry walls by heating iron rods with gasoline torches.

Electric Motor Elements

Reference to the accompanying sketches will explain the action of the electric motor and show its limitations. A, Fig. 1, is the old horse-shoe magnet we all know as we also are familiar with the fact that it will attract a small piece of iron. This action is identical with every application of electricity for power purposes. At B a wire is shown in position with reference to the ends of a magnet. As long as the wire is not connected it will lie in the position C, but if connected with the two poles of a battery it will jump over to the position D if the current flows a certain way, or to position E if the connections be reversed. If enough current be handy and the magnet is strong a person holding the wire with his hand will feel the same elastic pull as felt with the toy magnet A.

Elaboration from this simple case to the electric motor can be seen by reference to Fig. 2, which in place of the horns N and S of the horse-shoe magnet A we have the powerful ones E and F with a multitude of wires W arranged around the armature. All these wires are carrying current and try to get up or down into the clear or open places G and H in like manner to the wire C in Fig. 1. The part known as the commutator always feeds the current to those wires in such a direction that those on the left want to get to the upper open space and those on the right want to get to the lower. Since the wires are on the armature and fastened to it, this action tends to rotate the shaft in the direction of the arrow. The more current flowing through the wires the harder the pull.

We now come to the reason the electric starting motor is not strictly "positive" since the invisible pull on the wires which tries to rotate the shaft is measured exactly by the number of amperes multiplied by the number of volts taken from the battery. If this amount of current will produce pull to overcome the starting friction the starter will move it; but if not the motor will not budge and electricity flowing from the battery will only uselessly heat the whole machine as long as the switch is held closed.

The question therefore consists simply of furnishing sufficient power in amperes and volts from the battery to permit the pulling inside the motor to move the engine and keep it going until firing commences. From this it will be seen that the actual starting motor is a fixed quantity whose power is absolutely limited by the available current obtained from the battery. The size, age, condition, temperature, and amount of charge of this item determines whether or not the motor will have strength enough to overcome starting friction.

In our application of highly developed air starting to six cylinder motors we frequently meet with this statement that the electric starter is positive while air and others are not, but we fail to see why the pushing of 3,600 pounds of air on a 4-inch piston is any the less "positive" than current from a storage battery electrically pulling upon a quantity of cotton-covered wires. The fact is both systems are alike in that they start a six-cylinder motor with a cushioned impulse, but there is absolutely no distinction favoring either in the matter of the probability of the motor moving from any position. Both are certain in their functioning provided there is sufficient primary power stored and neither depend on as many variables as other forms of starters, but they are not "positive" in the true sense of the word.—C. S. Cole, Electrical Engineering & Storage Battery Co.

Worm Drive Desirable for Electrics — Top Mounting Most Efficient

CLEVELAND, O.—Editor The Automobile:—Worm drive, about which so much has been said in the technical press during the last 3 years, is peculiarly adapted to the electric car. The gasoline car has a system of change gears which cannot be eliminated by the substitution of the worm in place of the bevel. The noise of a bevel such as can be, and is now, produced commercially is no great item on a gas car because it is swallowed up by the other noises and is undistinguishable. On the electric the bevel noise has been the most prominent, and by its elimination the car has been improved wonderfully in its quiet running capabilities. Further than this, the worm eliminates one reduction. While single reduction bevel cars have been made, it is found that the motor is unduly heavy or suffers from an enormous copper loss. As far as efficiency is concerned that of the bevel gear runs about 97 per cent., that of worm about 95 per cent., the percentage of difference is easily accounted for either in the loss of the additional reduction or in the weight or inefficiency of the slow-speed heavy weight motor.

As to lubrication and mounting, our experience has shown that top mounting has distinct advantages. The only possible disadvantage would be the apparently better lubrication below. It is found that the worm when above is practically hid by the quantities of oil thrown around it by the revolving gear, and when it is remembered that the oil that actually lubricates is a microscopic film between the metal surfaces that are all but in contact there is nothing left to be desired in this respect.—J. H. Hertner, Rauch & Lang Carriage Co.

Use of Spring Dampener Prevents Lifting of Vehicle Wheels from Road

LOS ANGELES, CAL.—Editor The Automobile:—In reading The Automobile for January 8 I noticed a paragraph of particular interest in The Engineering Digest, page 147, entitled, Unsprung Weight and Rebound, and reading as follows:

> "Some discussion is now coming up, occasioned by the appearance of new shock absorbers, as to whether the checking of the extension of vehicle springs does not have a tendency to lift the wheels from the ground, especially when the weight of wheels and axle, together with other material only in part suspended on the springs, is kept as low as possible with a view to the tire economy said to be effected by this means. It is argued that the upward momentum of the body and load, if prevented from taking such action on the springs, necessarily must act on the axle and will make the wheels bob, the result being the wear of tires."

It would seem evident that those who argue in this manner have overlooked the fact that vehicle springs, in extending, must of necessity exert the same force downward as they do upward, and that a force equal to the one which causes the upward movement of the body and load is at the same time exerting itself downward against the unsprung portion of the vehicle. It is perfectly true that an uncontrolled spring, if allowed to overthrow, will jerk the wheels from the ground in the same manner that a spring compressed against a solid base will fly away from its base when suddenly released, but the use of a spring dampener prevents this overthrow, and thereby prevents, rather than causes, bobbing of the wheels. As a matter of fact, if the action of a spring dampener was so severe as to lift the unsprung portion of the vehicle from the ground, the springs would probably seldom sufficiently open after compression to permit the occupants of the vehicle to enjoy any comfort.

That absorbers of this character do not work injury to the tires in cars having a light unsprung weight was well demonstrated by a member of my family, who drove such a car equipped with absorbers acting only on the rebound movement for over 22,000 miles on the original set of shoes.

Racing drivers invariably say that it is almost impossible to prevent bobbing of the wheels without the use of dampeners, and that without them traction is so poor that even steering is difficult and hazardous.

After all, the proof of the pudding lies in the eating. A run over a rough stretch of road with dampeners, and another over the same stretch and at the same speed without dampeners should convince anyone that a dampener designed to check the extension of vehicle springs will cause the wheels to remain on the ground, rather than to leave it. It is of course understood that I do not consider devices which check spring recoils suddenly in the light of spring dampeners, but refer rather to devices which offer an instant but yielding resistance to spring extensions.—J. P. Baldwin, president Martin Shock Absorber Co.

Considers Electric Lighting Systems Expensive and Inefficient

INDIANAPOLIS, IND.—Editor The Automobile:—I have been interested in the discussion which has been going on in The Automobile regarding the extra consumption of gasoline by the electric generator, and the cost of electric lighting.

While this matter of cost is an interesting subject, it seems to me that some of the estimates you have printed do not throw very much light on this subject, since they appear to figure the

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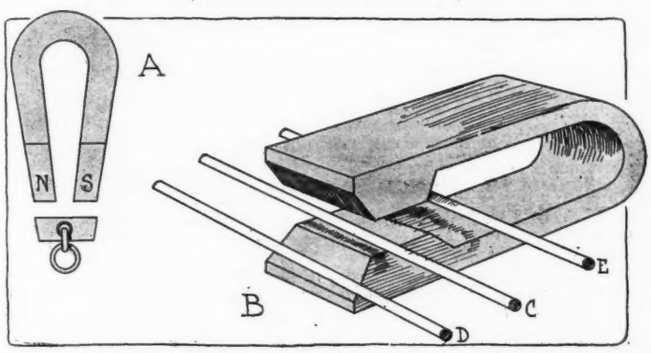


Fig. 1—Showing relations of magnetic forces and electrical conductors

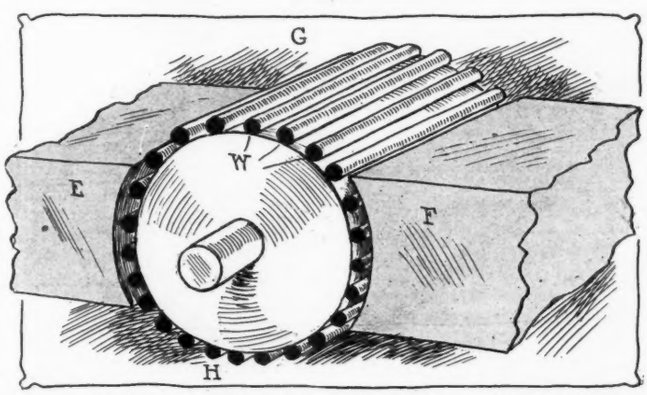
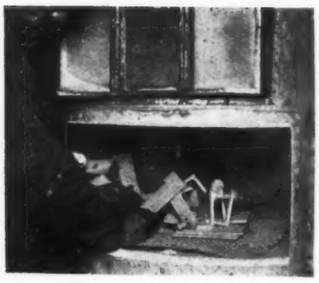
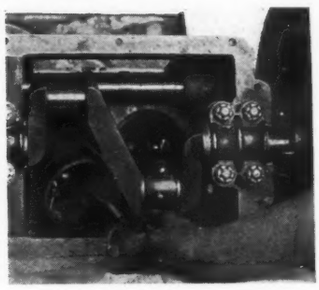


Fig. 2—Diagram of fields and wound armatures of electric motor



The Rostrum



Advocates Automatic Spark Advance Controlled by Centrifugal Governor

EDITOR THE AUTOMOBILE:—I am a constant reader of THE AUTOMOBILE and invite a discussion on the following opinions as to motor car control. Having tried many experiments with different control mechanisms, with the idea of making the management of the car by its driver more efficient under all conditions of road and weather and to make several changes that will enable the driver to have better control with less effort, I claim to have improved upon the standard of today.

My suggestion varies somewhat from the usual control system in that the spark be *automatically advanced by a governor, that the motor throttle be operated by a pedal, that a dash adjustment be applied to same for starting, that the service brake be operated by a prolonged action of the clutch pedal, and that the emergency brake also be operated by a pedal controlled by a ratchet mechanism.*

It is quite apparent that this change removes from the care of the driver a most occupying duty and leaves him freer to concentrate his vigilance to the safety of the machine and its passengers. The timing of the spark is like the valve timing in that it is simply a mechanical proposition, and to leave it to the driver to do this timing is crude and, as I have proven by actual test, inefficient and uneconomical. *A well designed governor can be made light and simple and should seldom, if ever, get out of working order.*

The type of pedal controlling the throttle differs from the conventional accelerator pedal in that it is operated by a sidewise motion of the foot. This is made against a light spring tension and I have found that the natural foot pressure upon the floor board causes enough friction to hold the pedal in any position. With this type of pedal, the motion of the car has no effect on the operation and I have driven two hundred miles straight without fatigue. For starting a simple adjusting mechanism is fitted on the dashboard which permits the driver to admit enough gas to the motor until it is running well.

This method of control, in my mind, is ideal and a decided improvement on the standard method because of its safety, economy and complete efficiency in all kinds of road work from country touring to driving in the most congested city street.

Cranford, N. J. H. L. COLLINS.

Lubricating Oil Temperatures in Motor

Editor THE AUTOMOBILE:—Will you kindly answer the following questions:

1. What temperature does the lubricating oil in the reservoir of an automobile motor rise to on a hot day?

2. At what temperature is it best to keep the lubricating oil?

3. About what temperature does the piston get on the wristpin side?

4. Does the lubricating oil that strikes the piston have any cooling effect on it?

5. Is it the lubricating oil coming in contact with the piston that heats it?

6. Is the piston and interior of crankcase kept cooler in a two-cycle motor than in a four-cycle, due to the cool air being drawn into the crankcase before passing to the cylinders?

7. What is the fault of crankcase compression in a two-cycle motor?

8. Does the crankcase for a two-cycle motor have a separate compartment for each cylinder?

9. Why cannot oil be used to cool a gasoline motor instead of water, if it is due to radiator trouble; why can it not be used to cool a stationary motor with a hotter cooler?

10. What is the objection to using an auxiliary exhaust in a four-cycle motor?

11. Would a motor with two pistons to each cylinder, such as the Gobron Brillé, made in France, be better balanced and give more power than a single piston motor, if one piston be set at 90 degrees to the other and reciprocate at half speed; that is, when the main piston is at top center, the other that moved at half speed be half way on its power stroke?

12. Will a double piston motor, like the Gobron Brillé, be able to run at as high speed as a single piston motor? Would a four-cycle motor with two exhaust valves opening and closing at different degrees, such as one open at the usual timing and closing 90 degrees on the exhaust stroke and the other open 90 degrees on the exhaust stroke and close at the usual timing, would this arrangement allow the low-pressure gases that remain in the cylinder a better exhaust?

Le Roy, Ill. H. J. FLEGEL.

—1. The lubricating oil in a gasoline engine on a hot day varies in temperature depending on what particular part of the motor you are considering. In the crankcase reservoir it will probably be close to 100 degrees in a well-cooled motor. If the motor is not cooled properly it may approach 200 degrees. In Europe, in order to keep down the temperature of the oil, many companies are fitting cooling ribs to the crankcase. The Peugeot car is a good example of this.

2. It is best to keep the temperature of the lubricating oil as low as possible.

3. It is impossible to state the temperature of the piston in a gas engine. It can only be approximated.

4. The lubricating oil that strikes the piston has a distinct cooling effect upon it.

5. One of the causes of the heating of the lubricating oil is the fact that a large part of it comes in contact with the piston when it is splashed against the piston by the lower end of the connecting rod in a splash lubricated engine.

6. The piston and interior of the crankcase is cooler in a two-cycle motor than in a four, as a general rule, because cool gases are drawn into the lower part of the motor and compressed there before they are admitted to the combustion chamber. This has

a cooling effect on the crankcase that is quite appreciable.

7. The use of crankcase compression in a two-cycle motor is not theoretically incorrect but often practical difficulties are experienced in the way of leaky bearings, which cause loss of the compression.

8. The crankcase for a multi-cylinder, two-cycle motor is always divided into separate compartments, providing crankcase compression is used.

9. Oil might be used to cool a gasoline motor, but it is hardly desirable to do so for several reasons. In the first place, the specific heat of oil is less than that of water, and, therefore, it would take more of it to give the same cooling effect. Then again, oil has a boiling point much in excess of water, and, therefore, would be objectionable because the motor might overheat. With water this is not so liable to happen because the temperature of the water cannot rise above 212 degrees Fahrenheit, and this temperature is not great enough to harm most motors. Another objection to the use of oil is its expense. If oil were used trouble would be experienced with the rubber hose connections, as these would rot very rapidly.

10. The objection to using an auxiliary exhaust is that it causes a complication in the manifold design necessitating two exhaust outlets, and if the auxiliary valves are mechanically operated, it also means another camshaft and four more valves to look after.

11. The balancing problems for the reciprocating masses remain practically the same on such an engine as the Gobron Brillé, as in the ordinary type of gas engine design but a high therm-efficiency is claimed for it.

12. Better scavenging is said to be secured with the double-piston motor.

Cylinders Should Be Rebored

Editor THE AUTOMOBILE:—I have a Marion car with cylinders 4 by 4, and as it did not have the power it ought to have, I removed the cylinders and found them worn a little oblong on top, .003 of an inch in the worst place from original bore, and on measuring the pistons found them .003 of an inch from original bore. I would like to know if by putting in new rings it will make the engine all right, or shall I have the cylinders ground and new pistons put in. The valves are good and tight.

St. Louis, Mo. READER.

In order to obtain good compression, it will be necessary to have the cylinders rebored and slightly larger pistons fitted. The new pistons should, of course, be lapped until a good fit is secured by working them in the cylinders with a mixture of oil and ground glass.

However, before going to the expense of having the cylinders rebored, it would be well to check up the measurements once more and make sure that the trouble is not due to some other cause, such as push rods out of adjustment.

Charging a Battery from 110-Volt Line

Editor THE AUTOMOBILE:—Will you please explain to me how I can use a 110-volt D. C. current for recharging a 6-volt, 60-ampere storage battery?

Newark, N. J. SUBSCRIBER.

There are three possible ways of charging a storage battery from a 110-volt D. C. line, but none of these are to be recommended under ordinary conditions. The most efficient way, but also the most expensive, is to use a motor-generator set in which a motor in circuit with the line drives a generator that delivers a 6-volt current to the storage battery, but the first cost of this system prohibits its use except where a great many storage batteries are recharged. It would not pay a man with an ordinary touring car with a storage battery for self-starter and electric lights to install such a system just for his own use.

Another plan that might be used is to absorb the voltage between 6 and 110 in a resistance coil, but this system is not advisable because the difference between these two voltages or 104 volts would be entirely wasted. The connections are simple, the storage battery being connected in series with an ammeter and the variable resistance. This resistance is reduced as charging proceeds in order that the rate may be increased proportionately.

A scheme that might be used where a great many batteries are to be recharged, but which is entirely out of the question for the individual owner, is to connect enough batteries in series to bring their entire voltage nearly up to 110. In other words, one might use eighteen 6-volt batteries in series, thus giving an aggregate voltage of 108.

The cheapest and best way to recharge a storage battery is to take it to a well-equipped recharging station, where this operation is understood and will be carried out correctly.

Touring Car Made into Tractor

Editor THE AUTOMOBILE:—Fig. 1 shows a photograph of an automobile tractor made by us from a two-cylinder motor car. The wheels of this car are regulation header binder bull wheels. The sprocket wheels on these wheels are the same as come with the binder originally. The sprocket on the jack shaft, which is the real axle of the car cut short and mounted on top of the frame, is especially made in order to get the proper gear ratio.

We believe this is a part solution for the disposition of second-hand automobiles as this has made a very satisfactory tractor. The rig was constructed purely as an experiment.

Wichita, Kan. THE JONES AUTO EXCHANGE.

Valve Setting for Racing Motor

Editor THE AUTOMOBILE:—1—Will you kindly advise me what is the best valve setting to use on a 4.5 by 5 Buick motor that is designed for high speed, being equipped with a special camshaft. The timing I am now using is as follows: The intake valve opens 14 degrees after upper dead center and closes 54 degrees after lower dead center. The exhaust opens 60 degrees before the bottom of the stroke is reached and closes 11 degrees after top dead center. If this is the proper timing the motor does not develop the power and speed it should have.

2—At what point should the magneto be set when the spark is fully retarded in order that full speed can be obtained from the motor?

3—Do you think an aluminum crankcase is strong enough for this motor?

Gaffney, S. C. W. R. TATTERSALL.

1—The valve setting that you now have is probably the best that can be obtained with the camshaft you have and so the poor performance of your motor must be due to some other cause. A special camshaft in itself is not enough to give a motor great speed and power. A larger carbureter should be fitted so that full charges of mixture can be drawn in at high speeds. The carbureter ordinarily fitted to a slow speed motor of this size having an opening so small that full charges of mixture cannot be obtained by the motor at high speeds.

Reciprocating parts including pistons, connecting rods, should be made as light as possible. Weight can be removed from the

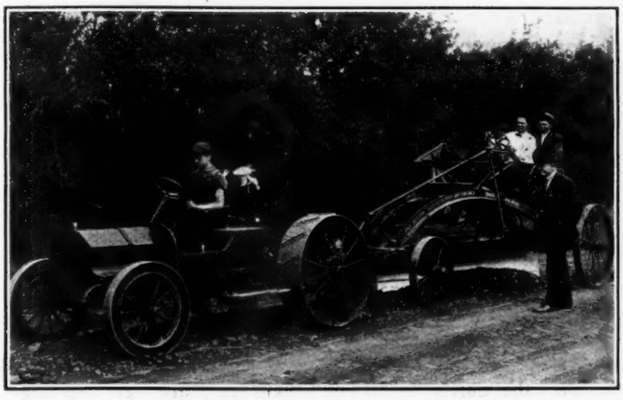


Fig. 1—Two-cylinder touring car converted into tractor for doing road work and other heavy hauling

pistons by drilling the surface below the rings full of holes about ¼ inch in diameter. The connecting rods can also be lightened by drilling the webs of the rods and it may even be possible to shave a little material off of the bearing ends.

Then again it is possible that the motor is all right but that the gearing you are using is too low to allow the car to develop the speed it should be capable of. This machine should have a 2 to 2.5 to 1 gear ratio depending on the speed and power that the motor is capable of developing.

2—With the spark lever fully retarded the magneto should be set so that the breaker points separate when the piston is about half an inch from top dead center. With this timing the motor will knock excessively when traveling at comparatively slow speeds on high gear, and so it is not advisable to use so great an advance unless the car is intended for nothing but high speed work.

3—An aluminum crankcase should be strong enough for this motor although it cannot be denied that a bronze crankcase of the same dimensions is much stronger. For this reason absolute insurance against crankcase breakage might make it advisable to fit a bronze crankcase.

Stripping Down an E. M. F. for Racing

Editor THE AUTOMOBILE:—Will you please tell me how I can strip down my E. M. F. for racing? I care nothing for the expense of the work but I want a wonderfully fast car.

W. J. D.

Washington, D. C.

In changing your car into a racing machine most of the changes will be made in the motor, although the spring suspension, gear ratio and the rake of the steering wheel will have to be altered. A suggestion as to how the machine should look is given in Fig. 2.

The most important change in the motor will be the retiming, so that the motor will develop a higher speed and greater power. This will involve a new camshaft. The timing should be as follows: Inlet opens 15 degrees after top dead center and closes 30 degrees after lower dead center. The exhaust opens 45 degrees previous to bottom center and closes at 10 degrees after the exhaust stroke is completed.

The piston should be made as light as possible by drilling holes in the lower halves and the connecting rods should also be lightened by drilling the webs and removing any excess material from the rod ends.

The clearance of the pistons should be increased to provide for the greater expansion caused by the excessive heat generated at extraordinary motor speeds. The clearance at the top of the piston should be .008 of an inch, at the first ring .005 of an inch and at the bottom of the piston .003 of an inch.

For high speeds the ordinary lubrication system will not be sufficient, so a tank should be fitted which supplies lubricant to the crankcase through a hand pump within reach of the driver and mechanic, so that oil can be injected as needed. The piping for this oiling system is shown clearly in the illustration. The pump supplies air to the top of the tank and forces oil out through the pipe that runs from the bottom of the tank to the crankcase. An ordinary tire pump can be used and it should be hinged to the dash at its base, so that it may be put out of the way when not in use and also so that the man operating it can hold it in the most convenient position for pumping.

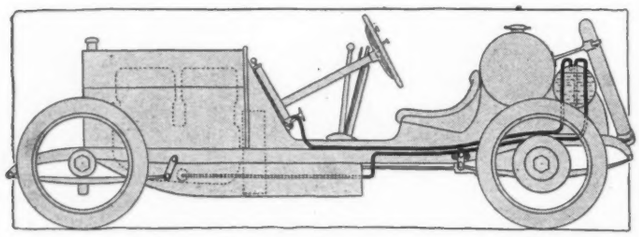


Fig. 2—Design for E. M. F. touring car converted into racing machine. The rake of the steering wheel is increased, bucket seats are fitted and flatter springs used. Tanks and tires are carried in the rear

The center of gravity of the machine should be made as low as possible by fitting flat springs slung under the axles. As full elliptic springs are used on the rear of the E. M. F. it would be advisable to put on half elliptics to reduce side sway, although such a change would involve expensive alterations in the frame construction.

It is almost needless to add that bucket seats practically resting on the floor boards should be fitted and that a large gasoline tank should be installed back of them. Provision for carrying spare tires should be made in the rear.

Consumption of High Speed European Motor

Editor THE AUTOMOBILE:—Will you please tell me what is the average gasoline consumption of the small cars in Europe that are equipped with light bodies and high speed motors?

New York City. M. S.

The average fuel consumption of a car weighing 2000 pounds and equipped with a motor 75 by 130 millimeters or 2.95 by 5.12 inches is about 1 gallon for every 26 miles. A car weighing 2400 pounds and fitted with a motor 80 by 130 or 3.15 by 5.12 inches bore and stroke will travel about 24 miles on a gallon of fuel. This performance is obtained when the best class of petrol, having a specific gravity of .710, is used.

Charging 6-Volt Battery From 220-Volt Line

Editor THE AUTOMOBILE:—1—In a recent issue of THE AUTOMOBILE it was stated that if a storage battery which had been charged in a cold place were discharged in a warm place, more current would be gotten out of it than was put in. Please explain where the extra "juice" comes from. Does it come from the atmosphere or from the destruction of some of the elements of the battery?

2—I have a 6-volt battery which I wish to recharge from a 220-volt alternating current line. What is the most economical way of accomplishing this? Vibrating rectifiers are rather expensive to begin with and moreover, if I possessed one of these devices, would I not be obliged to use a large amount of resistance to bring the current down to the proper voltage, thus wasting many times as much current as I could put into my battery? Rotary converters and other forms of charging apparatus, I find cost several times as much as my battery. What's the answer?

3—In regard to the Entz Electric Transmission described recently, I did not comprehend how the different speeds were obtained. Can you explain the method of control a little more plainly?

4—To the writer who has watched the development of the automobile industry since the beginning, the present tendency toward smaller and lighter cars is very gratifying. However, it seems to me that there is one type of light car which is being neglected by manufacturers. The numerous makes of light cars such as Ford, Maxwell, Metz, etc., are all right for the price asked for them, but is there not a real demand for a really high-class, light car; a car of the best material and finest workmanship, with about 105-inch wheelbase and 34 by 3 or 36 by 3.5-inch wheels, block motor, three speed transmission and long flat springs? Such a car could be built for from $1200 to $1500 and the five passenger type should weigh under 2000 pounds fully equipped. The trouble with our present light cars is that they ride too hard and are too hard on tires. This is because of small wheels and tires. Of course, a small car with 34-inch wheels might be top-heavy but this difficulty could be got around by underslinging the frame.

This car could not compete with present light cars in first cost, but I believe there is a large number of the "motor-wise" who would be willing to pay and pay well for the speed, comfort, and economy of operation such a car would make possible.

5—I understand that abroad it is becoming quite common to

clamp thin disks of metal on either side of the spokes of a wheel to lessen wind resistance and provide a wheel which is easier to keep clean. The device also obviates the danger of broken bones through entanglement with a revolving wheel with many spokes. Is such a device made or marketed in this country? Is it patented or patentable?

D. C. CANFIELD.

East Canaan, Conn.

1—The chemical activity of the constituents of a storage battery increases with the temperature and therefore the discharge rate may be greater when the battery is warm than when it is cold. This does not mean that the total output of the battery is any greater, but merely that the battery is emptied of its charge in a shorter time.

2—Providing that there is a garage available at which you can have your storage battery recharged, you will find that this is the most economical way when you only have a single battery. As far as we know there is no vibrating rectifier made for a 220-volt circuit, and so in order to accommodate a 110-volt rectifier to a 220-volt line, one-half the voltage would need to be absorbed in resistance, thus more than twice the energy required to charge a storage battery would be necessary, in other words, for every unit of electrical energy given to the storage battery, more than one unit would be wasted.

3—The Entz transmission used on the Austrian Daimler and which was described in the December 8 issue of THE AUTOMOBILE, obtains speed variations by changing the resistance in the generator field. This is done by means of a small control lever located on the steering wheel and which operates a small resistance box. On what corresponds to high gear with this system, all the resistance is out of the field and the armature is short circuited. A heavy current flows through the armature and attracts the field so strongly that the slippage between the field and the armature is very small thus closely approximating the high gear position with a sliding gear transmission. When a lower speed is wanted, the motor is brought in circuit with the generator and the resistance in the field is increased by moving the control lever, thus weakening the field. With the weaker field, the armature generates a lower voltage, the current flowing through it is therefore less, it attracts the field less and so other things being equal, the slippage is increased. But with increased slippage a greater quantity of current flows to the motor and thus helps drive the car at intermediate speeds.

5—There is no patent on clamping thin disks of metal to the wheels as you suggest. A set of these disks can very easily be made out of thin sheet steel by cutting them to fit the felloes and hubs of the wheels. The set of disks for each wheel can then be simply and securely fastened by bolting them to each other so that they press tightly against the spokes of the wheel.

Description of Overland Ignition System

Editor THE AUTOMOBILE:—Will you please publish a diagram and detailed description of the ignition system used on the 1914 Overland?

Modoc, Ind. T. C. KABEL.

The ignition system used on this year's Overland is a dual system made by the Splitdorf company.

A diagram of this system is given in Fig. 3. The primary current is supplied either from a battery or from the magneto armature, the battery being used for starting and the armature current for running.

The primary current is passed through the induction coil seen at the left of the illustration, where it is transformed into a high-tension current, and is delivered to the spark plugs through the magneto distributor.

The battery circuit is clearly shown on the left at the bottom, and consists of a storage battery, or series of dry cells, connected up to the low-voltage winding of the induction coil.

The low-tension magneto circuit is indicated by the wires B and C, the current flowing from the magneto armature out through the binding post on the breaker box, along the wire C to the coil.

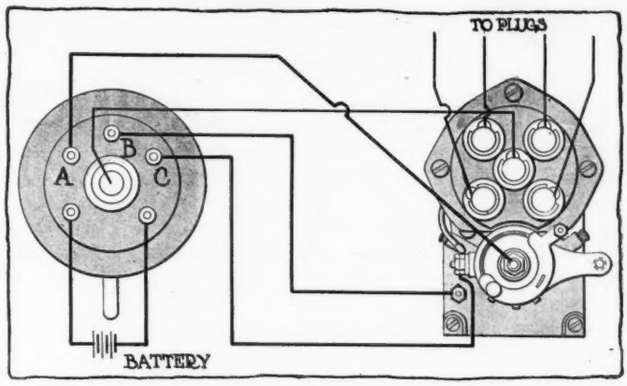


Fig. 3—Splitdorf ignition system as used on the 1914 Overland. The low-tension wires are indicated by the heavy lines

The current passes through the coil and then back through wire B to a ground on the magneto.

The high tension current is carried from the coil to the distributor by wire B. From the distributor the current flows to the four plugs as indicated. The return high-tension circuit is also through the wire B.

Motor Vibrates When Idling

Editor THE AUTOMOBILE:—I would like to know how to put a four-cylinder motor in perfect balance. Must the piston and each end of the connecting-rod weigh the same?

I have a 1912 Cadillac, the motor seems to vibrate more than it should when running idle at high speed, but is all right on the road.

Cambridge, Mass. C. B. TAYLOR.

—In the issue of THE AUTOMOBILE for December 18 in the Rostrum, there was a letter that gave in detail the method of balancing a motor. Briefly, this consists in making all the pistons and all the connecting-rods the same weight.

When a motor is running idle at high speed, its vibration is more noticeable than when it is driving a car at the same speed because the vibration of the car is so great that the motor vibration is not felt.

Suggests Noiseless Method of Gearshifting

Editor THE AUTOMOBILE:—I would like to suggest a method of changing from a higher to a lower gear that, while it may not be entirely new, is probably unknown to the majority of your readers. It is merely to make the shift by holding the accelerator all the way down, and releasing the clutch just enough to allow the motor to speed up to approximately to the speed required when the lower gear is engaged.

The advantages of shifting this way are best shown by explaining what happens when it is done in the ordinary way and then point out how this method differs from it. Ordinarily when the motorist wants to shift down he pushes out the clutch and forces the lower gear into engagement as quickly as possible with the result that the teeth of the meshing gears must grind against each other until the clutch shaft is brought up to the proper speed.

But contrast this with the other way. The clutch is released, allowing the motor to accelerate to the speed required by the lower gear. The gear lever is then brought to neutral and the clutch shaft now being free immediately speeds up to the speed the motor is running at. The lower gear can now be engaged without clashing. The advantages of performing the change in this manner are that shifting is done noiselessly and with little strain on the gears.

It may be argued against this suggestion that it is impossible to guage the speed of the motor accurately enough to make a silent change, but with a little experience it will be found that it can be done well enough to accomplish the desired result.

New York City. H. F. B.

The Engineering Digest

Developments in Two-Cycle Motors Making for Speed, Fuel Economy and Reliability

AN IMPROVEMENT IN CONTROL OF THE GASES

SIMPLICITY, silence and low cost of construction have made the two-cycle motor popular for motor boats and might make it popular for automobiles, as being the most obvious type of valveless motor, if the combination of the exhaust stroke and the induction stroke into one did not render it very difficult to attain fuel economy and a responsive throttle control. These difficulties were for a long time found irreconcilable with the desired high motor speed. From a manufacturing standpoint it has been a serious disadvantage that it was found practically impossible to turn out any one type of two-cycle motor in different sizes without making changes in the shape and size of deflectors and in the ports and air pressures which could not be calculated in advance but had to be tried out by costly and time-consuming experimentation. Nevertheless several factors in the present situation are again bringing two-cycle motors under consideration. By new charging-methods it has been found possible to increase the motor speed without an inordinate waste of fuel—going out with the exhaust—the Koechlin, the Côte, the Legros and the Cid being examples of two-cycle motors turned out in France in which the speed reaches as high as above 3,000 revolutions per minute. On the other hand, the very successful two-cycle Diesel motors for marine and stationary work have encouraged the idea of overcoming the main difficulty in the two-cycle principle by delaying the carburetion to the moment when ignition is to take place; that is, injecting the liquid fuel by compressed air during all the first half of the power stroke, and while no conclusive results have been obtained for small high-speed motors as yet, by this method, the principal difficulty to be overcome consists perhaps in the measuring of very small quantities of liquid fuel with a high degree of accuracy. The increasing desire to make use of fuels, such as benzol and kerosene, which are not readily vaporized by the mere action of a suction current, also make this system seem very attractive, and it is apparently the only one by which the weight and speed can be brought to the standard required for light transportation work—the Diesel system making the two-cycle motor speedier and more economical than it could be with the fuel handled in gaseous form and the two-cycle system getting more power out of a Diesel motor of a given weight than can be had on the four-cycle plan.

The lines along which progress in the design of two-cycle motors is actually being made are explained popularly by Mr. d'About in the form of a description of motors which were shown at the last Paris salon. Among these, the Lutin motor presents some new developments worthy of notice, although its makers bid more strongly for the motor boat than for the automobile market at the present time.

Those who have followed the twin-cylinder two-cycle motor with a mutually operated fuel chamber will probably find only one feature of interest and novelty in this description.

To make clear at what points the Lutin represents progress in design, it is expedient to show the main principle of its design in diagrammatic form first, as done in subfigures 1 to 5 of Fig. 1, and subsequently the practical departures from this plan, which are illustrated in subfigures 6 and 7. The pistons are of the two-story type, the lower portion being of the larger diameter and serving as preliminary compressor for the explosive charge. The motor has two cylinders and carries on the side a distributor box.

With reference to the diagrams, representing a single-cylinder motor, the pump piston draws the charge from this distributor and compresses it only sufficiently for forcing it into the cylinder where the real compression takes place, as usual, followed by ignition and expansion. Subfigures 1 to 5 represent the cycle of functions as follows: In 1, the explosion chamber is filled with gas, the ignition takes place and the piston descends, but as the space P′ is thereby enlarged and as the rotary valve V at the same time is placed in communication with the carbureter by the rotation of valve V, it fills up with fresh gas. In 2, after the expansion of the gas, the exhaust port E is opened and the gas escapes with sufficient speed to leave at the end a slight depression in the cylinder, favorable to the introduction of the fresh charge; during the same time the pump continues to draw upon the distributor. In 3, with the piston still lower, the intake port O′ has been uncovered and fresh gas enters the cylinder, while the exhaust remains open and the deflector plays its usual part in preventing the new gas from mixing with the burnt gas; in this position the pump is still drawing mixture from the carbureter. In 4, the exchange of new for old gas continues, but the pump is now compressing, the distributor valve having turned and broken off connection with the carbureter and having opened the communication between the pump and the intermediate space where the gas is lightly compressed. Finally, in 5, the pump continues to press gas into the intermediate space, but the piston, having ascended, covers again the ports O′ and E, and the cylinder is closed.

Working strictly on this plan a single-cylinder motor would have two grave defects. The work required for compressing the mixture, so as to make it move from the intermediate reservoir to the cylinder, is not negligible and yields no return, and, furthermore, condensation of the mixture would be sure to take place in the intermediate chamber where it would be stored for half a turn. It is correction of these faults which is of interest, as the means adopted go beyond merely coupling two cylinders together and making one charge the other.

To Avoid Mixing of Gases

In the actual motor represented in subfigures 4 and 5 the pistons of the two cylinders are 180 degrees apart and the gas compressed by the pump in the left cylinder is sent directly to the right cylinder almost without compression in the intermediate chamber, only passing through it and suffering no deterioration, therefore, from condensation. Some difficulties arise in position 3 if the motor speed is high. In that case the exhaust does not get time to become complete before the admission port is opened, and a back pressure is liable to take effect from the cylinder to the intermediate chamber, as the capacity of P′ cannot be larger than that of the cylinder if waste of gas shall be avoided, and the exhaust will thus be mixed more or less with the admission gas, the total volume, under the supposition of higher than atmospheric pressure for the exhaust when the intake port is opened, being equal to that of the chamber plus that of the cylinder, and it will then be a mixture of fresh and burnt gases which will flow back into the cylinder when the

pressure is relieved. This could be obviated by advancing the exhaust a trifle, placing the ports E a little higher, and by retarding the admission, but this solution runs against difficulties of construction, and another plan, more effective for admitting high speeds, has been adopted. The admission from the intermediate chamber to the cylinders is regulated by means of the same distributor which is used in connection with the work of the pump pistons. An opening O is made in the wall of this valve body and when this opening registers with the inlet port, for each cylinder, the gas is transferred, and the registering is made subject to a certain automatic adjustment according to the speed of the motor. [Mixing and waste of the gases should thus only take place during the periods of accelerations but not after the acceleration is accomplished.—ED.]

The control of the rotary distributor is effected as follows: The crankshaft is divided in two portions by a large central bearing to which is bolted a large worm gear which runs a smaller wheel at equal speed—the transmission ratio being regulated by the pitch; and the small pinion drives a vertical shaft to which the base of the distributor is keyed. [This does not make it clear how retarding of the opening of the admission port is effected, but the author's description gives no further details. Unless some feature has been left unmentioned, the advantage of closing and opening the port by a registering port moved from the crankshaft would seem to lie in getting a period for the registry of the two ports depending on the rotary speed of the crankshaft, practically coinciding with the mean piston speed, instead of one determined by the actual piston speed near the bottom of the stroke, where it tends toward zero and therefore varies much less. The difference in the two methods can of course be made to take the form of a retardation of the opening of the admission port with increasing motor speed, by choosing the direction of rotation accordingly, and this effect can be accentuated by shaping the ports broad rather than high. Some doubts may be involved in this matter, and there seems to be room for an interesting graphic and mathematical demonstration to show just how much may be gained in the matter of keeping the intake and exhaust gases apart at different motor speeds by the means indicated and how the movements as well as the dimensions, shapes and locations of the ports may best be regulated for getting the desired effect.—ED.]

Results Obtained in Practice

A two-cylinder Lutin motor of 90 by 110 bore and stroke gives about 20 horsepowers, while a four-cycle motor of the same cylinder dimensions, the same port areas and the same compression would give about 14 horsepowers, would weigh more and would be less compact and simple.—From *La Vie Automobile.*

Wear of Tires with Wire Wheels—Accuracy a Factor

FULL credit has never been given to the wire wheel for reduced wear and deterioration of tires. The data based on experience have not been universally accepted as conclusive, perhaps because they were presented by manufacturers of wire wheels and in the nature of things could not easily be confirmed excepting by costly simultaneous test runs over many thousands of kilometers with cars similar in all respects save the type of wheel. And the mere reasoning on the subject has not convinced all. Even if it is conceded that the wire wheel has smaller weight than the wood wheel near the circumference and that the tires therefore should suffer less from abrasion at retardations and accelerations, and even if it is difficult to deny that the metal rim and spokes should tend to keep the tires cool, while the elasticity claimed for most wire wheels should soften road shocks in some measure, it has not yet become an indisputable axiom that the tire economy gained by using wire wheels is an important or even only an appreciable factor. One more strong reason in support of the data and the claims might perhaps carry conviction to the unwilling, says *The Autocar* in its issue of January 10 and proceeds to supply it. The wire wheel is more nearly true, both radially and laterally, than any wood wheel made. Especially, it is likely to remain true, or, if it does not, it can readily be trued, while every wood wheel warps more or less in course of time and cannot be trued. Now, it is admitted that the radial accuracy or circularity of the wheel cannot matter so much, since roads are not so smooth as to make the variation in shocks appreciable [yet those holding a brief for wire wheels need not agree with *The Autocar* in this admission as any departure from circularity or from concentricity with the wheel shaft makes itself felt in a periodical action of the vehicle springs involving considerable extra load oscillation and tire pressures to be added to the average of somewhat similar effects due to road inequalities—ED.], but the lateral accuracy of the wheel, by virtue of which all wobbling and grinding of the rubber tire against the road grit is avoided for straight-ahead driving [except that which may be due to faulty co-ordination of the steering gear with the front vehicle springs] is a matter of great and generally admitted importance. [Just why wobbling of a wheel should be considered as equivalent to a grinding motion is not explained by the British contemporary. When the driving takes place in ruts and the wobbling causes the sides of the tires to slide against the sides of the rut, the case is plain, to be sure, but otherwise the difference in action between a narrow tire wobbling for

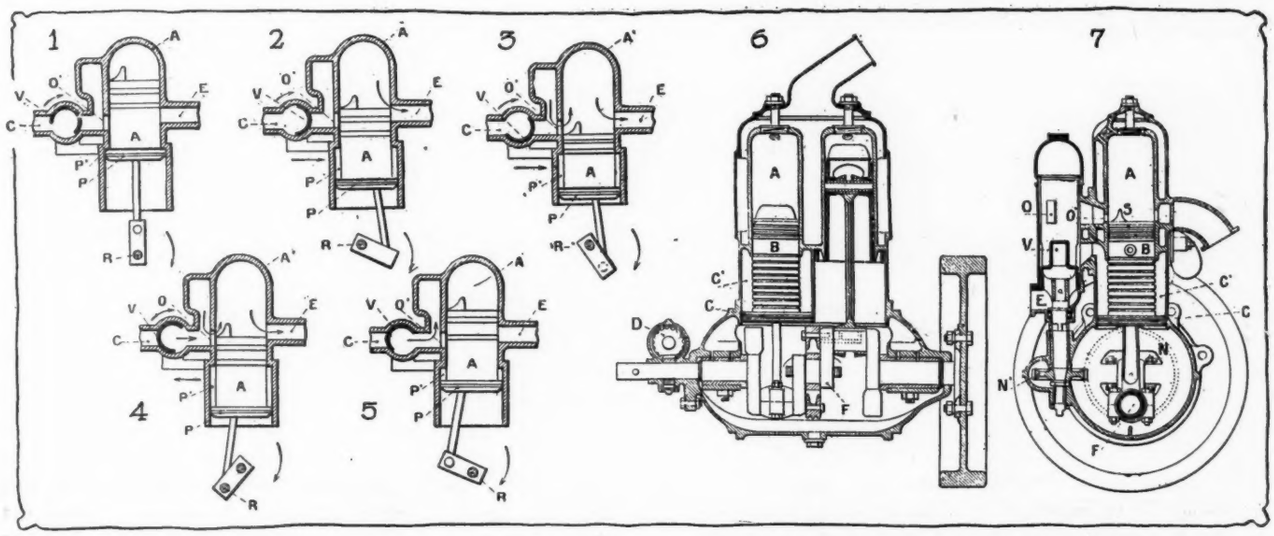


Fig. 1—The Lutin two-cycle motor. Subfigures 1-5, diagrams of principle. Subfigures 6 and 7, actual construction

lack of lateral accuracy and a broader tire striking the ground now at one side of its tread and now at the other does not seem to be manifest. The circularity may, after all, be the more important element—Ed.]

Valve-Grinding Device Centering Itself on the Valve Stem

A NEWLY patented appliance for truing the faces of poppet valves has appeared in the British market and is shown in section in Fig. 2. To the casing B is screwed the cutter A. Inside the casing are a double-coned ring D and a single-coned ring E, which form ball races for two sets of steel balls. The function of parts D and E and balls C is to hold the valve stem concentrically within the appliance whatever the diameter of the stem may be, so that the valve face will bed evenly on the cutting surface when it is being trued up. The cones are adjustable by means of the threaded nut F. To turn up the valve face the valve is rotated on the cutter by means of a screwdriver or a brace bit, and the appliance itself may be held in the hand or gripped in a vise. When the cutting surface has become worn out, it can be recut or renewed. —From *The Engineer*, January 9.

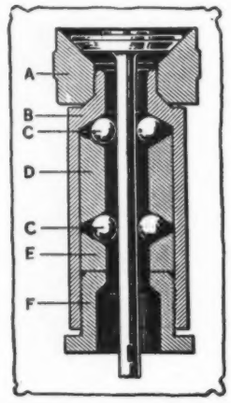


Fig. 2—Valve grinder

Typical Oiling System for Motor of Standard Design

AN oiling system such as used in 12-16 horsepower Delahaye cars contains no strictly new features but is worked out on a very conservative plan meant to secure reliability with a minimum of complication and maintenance. The motor is provided with a crankshaft of unusually large dimensions, even for a shaft of the type with only two bearings and a double central crankpin for the middle cylinders, and the two bearings are double ball-bearings, admitting a ready flow of the oil passing through them. It is for a shaft and design of this type that the oiling system is especially adapted.

The sump of the crankcase forms the oil reservoir and its bottom slopes down to the rear where the pump is located. The latter is controlled by a vertical shaft driven from the camshaft by worm and pinion and sends out the supply of oil through the joint D, Fig. 3, which is secured by the hollow screw E and to which are attached two pipes, F and G, to take the oil to each of the two ball-bearings of the shaft. The one running to the rear bearing is branched to the pressure gauge on the dashboard. The overflow from each of the ball-bearings serves for the two nearest connecting-rod bearings. To this end it is received in a circular collector ring P, mounted upon the crankarm nearest to each ball-bearing, and, as these rings are eccentric to the shaft, it is here thrown by centrifugal action to the point in the ring farthest removed from the shaft. A little partition wall in the ring at this point separates the oil coming from one side of the ring from that coming from the other side, dividing the supply from each ball-bearing in two equal portions, and on each side of the little partition there is bored a hole connecting with a channel in the crankpin. One of these channels Q takes the oil directly to the first connecting-rod bearing, running as nearly radially as possible, so as to get the benefit of centrifugal action. The other channel R is bored obliquely through the first crankpin, getting only a little centrifugal action, and at the other side of the pin is continued by means of an external curved pipe reaching to crankpin number 2 at a point on the latter a little farther removed from the shaft axis than its starting point on pin number 1. The curve is of course so shaped that at no point the oil is required to work against the centrifugal tendency. But for the little partition in the collector ring the first crankpin would get more oil than the second, as the conduit to the latter is the longer of the two and therefore opposes a greater resistance to the passing of the oil.

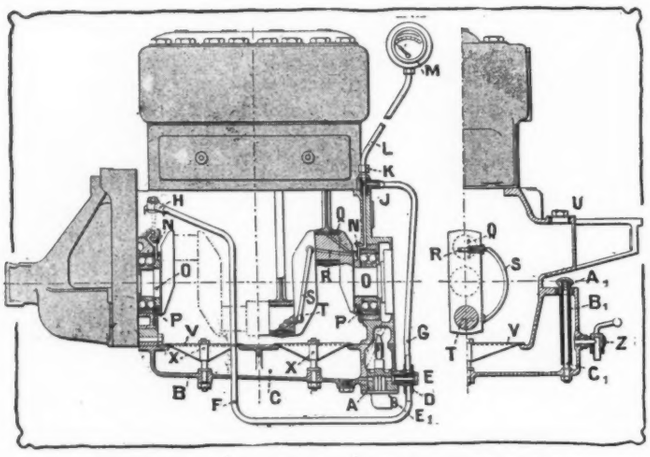


Fig. 3—Oiling system for typical four-cylinder motor.

The oil oozing from the connecting-rod bearings is thrown in all directions and reaches the pistons, piston pins and the camshaft. It falls back to the bottom of the crankcasing, passing on the way through filters V. These are formed of fine metallic screens stretched over the top of perforated cones which are secured by bolts X to gudgeons in the floor of the casing, the securing-nuts being on the outside of the casing. The filters can thus readily be removed and cleaned when the lower part of the casing is dismounted.

The plug U indicates the place where oil is poured into the casing. Petcock Z gives the level which must not be exceeded, and the quantity remaining at any given time is shown by the gauge B, comprising a tube secured by a threaded button A at the top and fitting at its lower end over a stem bolted to the bottom of the casing. Screwplug D is for draining, and at E is located the return valve of the pump, by means of which the pressure may be regulated.

No breathers in the ordinary sense are provided, but the front end of the crankshaft is bored out to effect communication with the atmosphere, which provision is believed to have the advantage of wasting no oil and obviating all oily deposits on the exterior of the motor and its accessories, since oil is always thrown from the shaft outwardly but not toward its axis.—From *La Vie Automobile*, December 27.

The Firing Point of Oils

AS a result of scientific tests made by Dr. H. Holm, the temperatures at which different substances will catch fire in contact with atmospheric air at ordinary pressures, have been established in a number of cases. The figures of most obvious interest are: Benzine (gasoline) 415 degrees centigrade; petroleum (kerosene) 380 degrees; gas oil 350 degrees; machine oil 380 degrees; coal tar 500 degrees; tar oil 580 degrees; benzol 520 degrees. These temperatures are greatly influenced by the presence of other substances. Hydrogen, methane and ethane, for example, but not ethylene or acetylene, act as catalyzers, preciptating the inflammation of the oils and gases mentioned. Among solids it is the substances with the biggest molecules which most readily burst into flame, while gases, as a general rule, kindle only at higher temperatures.—From *The Engineer*, January 2.

New Steering Gear

Works on Principle of Double Nut and Screw—Two Screw Abutments for Quick and Easy Adjustment

THE Ross-Moyer Mfg. Co., Cincinnati, O., has designed a new type of steering gear which will shortly be placed upon the market. This gear, which is shown in the accompanying illustration, works on the principle of a double nut and screw. The nuts are seen at A and A1, and the screws at B and B1. These screws have gear heads G and are actuated by an intermediate pinion P attached to the steering shaft S. When this shaft is turned, it therefore operates the meshing gear heads G and thus one nut is drawn upward and the other forced downward as the case may be. These nuts at their lower ends E and E1 connect with the rocker shaft R, which is fastened to the shaft T. This latter shaft moves the lower steering connections back and forth to control the wheels.

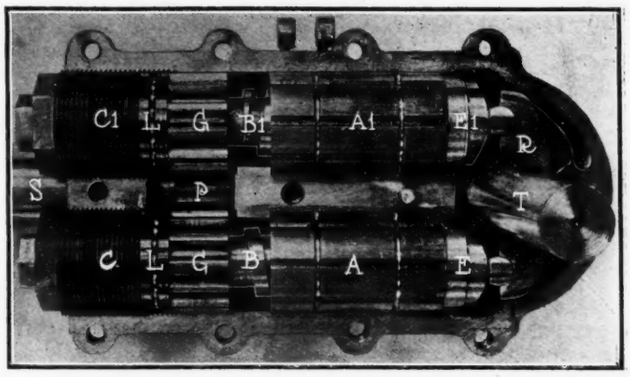
The adjustment features of this new gear are specially notable. Suitable screw abutments C and C1 are mounted at the head of each screw as shown, and by the adjustment of either of these abutments the entire play or wear can be immediately taken up. It is pointed out by the maker that this taking up may be carried even to the extent of completely wearing out the threads in both screws and nuts, as well as the rocker shaft and its connections, if necessary.

The adjustable screws are provided with ball thrust collars L and the heavy bronze nuts are fitted with hardened steel caps to set against the sliding pivot blocks which actuate the rocker shaft. The latter is supported in a long bronze bearing of large diameter.

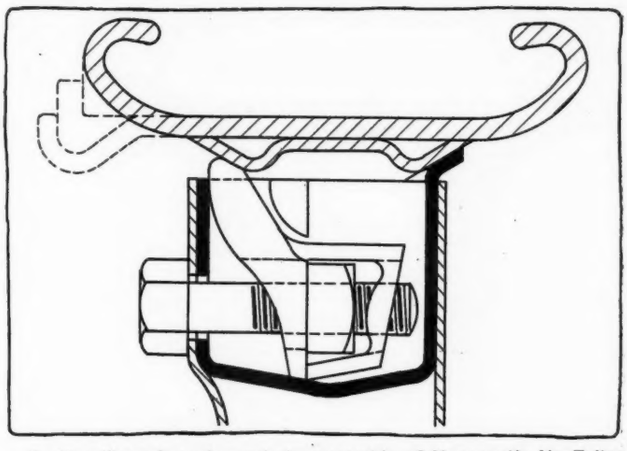
All Bearings of Ample Size

It is stated by the designer that all bearings in this gear are of ample size to minimize the wear, and that the entire gear has been designed to meet the requirements of simplicity in construction, strain shock, vibration and dirt to which it will be subjected, and at the same time to keep it within the manufacturing cost of all manufacturers.

The entire mechanism is dust proof and packed in grease, and the designer explains that, because of the construction, a suction or pump effect is produced, which causes every part and bearing in the entire casing to be efficiently lubricated.



New double nut and screw steering gear which is soon to be marketed by the Ross-Moyer Mfg. Co., Cincinnati, O. A and A1 are the nuts and B and B1 the screws. GG are the heads of the screws. P is the intermediate pinion actuating the screws and attached to the steering shaft S. The lower ends of the nuts E and E1 connect with the rocker shaft R, which is fastened to the shaft T. The latter shaft moves the lower steering connections back and forth to control the wheels. L and L are ball thrust collars which are provided on the adjustable screws, B and B1

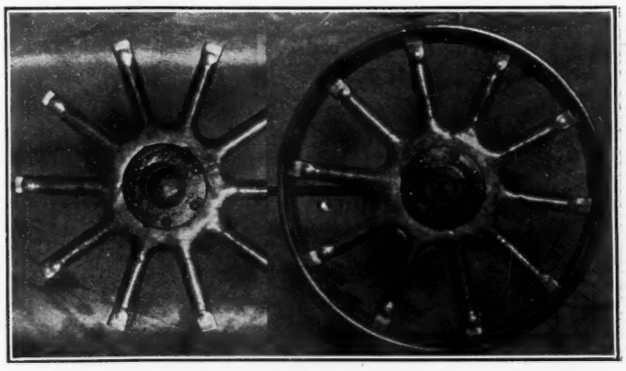


Section through spoke and rim assembly of Newmastic No-Felloe pressed steel wheel. The spoke attaches directly to the rim as shown, the bolt serving to hold it in position. The dotted lines represent other types of rim

Newmastic Brings Out No-Felloe Pressed Steel Wheel

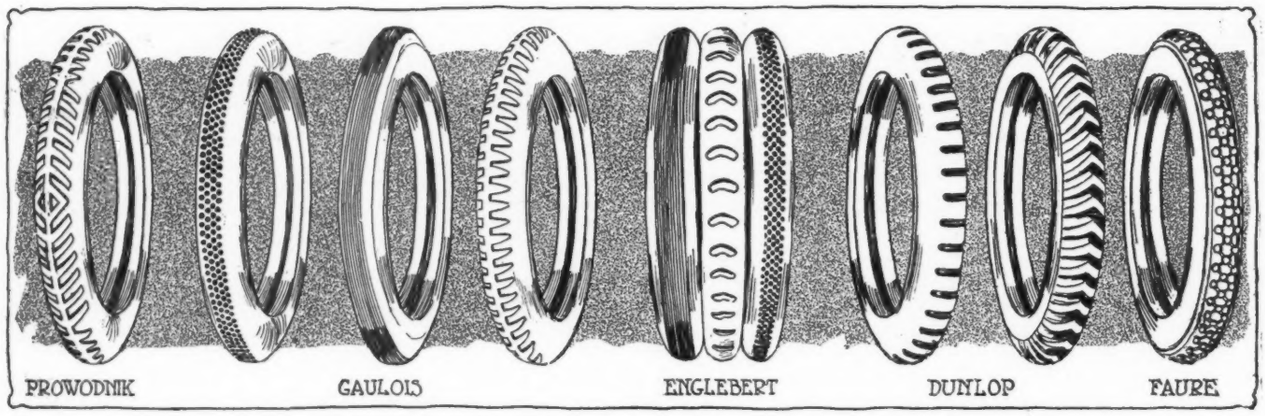
ONE of the new things shown at the New York automobile show is the No-Felloe pressed steel wheel of the Newmastic Co., New York City. This wheel is novel in construction, being made in halves which, when put together, have the shape and appearance of ordinary wood spokes and which fit into an ordinary wheel hub but without a felloe. These halves are welded together and the end of each spoke received a small pressed steel cup, a bolt and a clip. The tire-carrying channel, or rim, has on its under surface two annular grooves. The clips on the end of the spokes are designed to grip these annular grooves with great pressure as each bolt is tightened. It is claimed for pressed steel wheels that, when made the same weight as the wood wheel, they are twice as strong, and they do not dry out, shrink and become loose.

It is also stated that steel wheels can compete with wood wheels in the cost of manufacture. The particular advantage of the No-Felloe type of steel wheel lies in the fact that the tire-carrying channel is demountable. It is, therefore, not necessary to furnish or carry a spare wheel, which results in a saving of at least 25 per cent.



Left—Newmastic pressed steel wheel without rim. Note clips on ends of spokes. Right—Wheel with rim in position and locked on rim

Steel wheels greatly increase the safety of automobiling for the reason that it takes a much greater strain to destroy a steel wheel than a wood wheel, and when a wheel does finally give away it does not collapse suddenly as does a wood wheel but bends and, in bending, acts as a shock-absorber.



Treads of foreign tires exhibited at the annual Salon of the Importers' Alliance held in New York recently. The tires illustrated are some of the most distinctive of their respective lines. All are described herewith

Foreign Tires at Importers' Salon

Four Makes of Casings and Tubes Manufactured Abroad and One Built in America from Imported Material Represented—Features of the Various Lines

In spite of the tremendous production of the American automobile tire factories and the great volume of business which practically all of them are doing, the European makers of tires are finding a ready market for their products in this country. Of course, the recent lowering of the tariff has had an appreciable effect in enabling them to list prices which compare well with those for the American-made tire, but even before this was possible the sales of foreign-made casings and tubes in the United States was on the increase. Several of the manufacturers of these foreign tires exhibited at the Importers' Salon in New York in 1913 and this year there were five well-appointed exhibits at the Salon and one of the companies also had a booth at the national automobile show in the Grand Central Palace. The exhibit, however, was practically the same as that of the company at the Salon, so a glance at the latter will suffice, The five exhibitors at the importers' show were: Dunlop, Otto Braunwarth, New York agent; Englebert, Englebert Tyre Co., New York; Faure, A. Faure, New York; Gaulois, Gaulois Tire Corp., New York; and Prowodnik, Columb Tyres Import Co., New York. Every one of these tires is manufactured abroad except the Faure, which is made in Akron, O., from fabric imported from France. The lines offered by these companies are as follows:

Dunlop—Has Two Types of Non-Skid

The Dunlop tires and tubes are made in England by the Dunlop Rubber Co., Ltd., and are sold in the United States by Otto Braunwarth, Inc., who is the sole agent for this country. The line comprises two types of non-skid tread casings, the Traction tread and the Cross-groove, both of which are illustrated herewith over the name Dunlop. A full line of all red inner tubes is also made, the sizes running from 28 by 3 to 39 by 6 in English measure and from 760 by 90 to 935 by 135 in metric sizes.

The Traction tread is the leader. This is moulded in one piece, the corrugations being built into the tread of the tire and not merely stuck on it. Owing to this method of manufacture, the corrugations are not likely to tear away and thus expose the fabric to sand, water and other destructive influences. This solidity also gives maximum strength and wear-resisting qualities. The tread is unusually thick, the anti-skid surface being deep so that when the pavement is greasy, or the roads are muddy, the pieces of tough rubber which form the V-shaped corrugations have sufficient resiliency to grip the greasy pavement in a most tenacious manner or to take hold in the mud. The makers liken the operation of the tread to that of the wheels of a steam traction engine. The great depth of the corrugations also serves the purpose of insuring resiliency and comfort. The lateral arrangement of the big corrugations is said to prevent any tendency to side-slipping.

An important feature in the construction of the Traction tread casing is that the carcass proper is kept clear of the road, this precaution rendering the tire much less likely to puncture. The corrugations are also shaped in such a way that mud is thrown out and the possibility of stone bruises is reduced to a minimum, according to the manufacturers. Dunlop tires are made in regular clincher, Q. D. clincher and straight side types.

Englebert—Made in Three Treads.

The Englebert Tyre Co., New York City, is the sole American representative of the Englebert tire, manufactured by O. Englebert Fils & Cie., in Liege, Belgium. The makers claim that these tires are all hand made, the materials used being the best obtainable and the workmen being highly trained in the trade of tire-making. The tires are built in three types, non-skid, steel-studded and plain tread. Each type is fundamentally the same as the others, having eight layers of fabric, three breaker strips, unusual thickness of tread and side walls. These features, according to the makers, practically eliminate all trouble from blow-outs and rim-cuts.

The non-skid tread is called the Chevron, from the pattern of the corrugations which are molded into the heavy tread. The use of this tread is claimed by the manufacturers to prevent skidding and side-slipping. All tires are made in both regular and quick detachable clincher types in sizes from 28 by 3 to 38 by 5 1-2 inches in English sizes and in 810 by 90 to 935 by 135 millimeters in metric. On the steel-studded casing the tread is of waterproof chrome-tanned leather. Typical foreign equipment is given by the makers as that of a Chevron, non-skid, on the

rear left and front right wheels, reversing the order with the steel-studded treads, this combination being said to provide an absolute guard against skidding under every possible road condition. This selection is recommended as producing the most satisfactory results. The Englebert company, besides making casings, manufactures inner tubes of all sizes.

Faure—A Foreign-American Tire

The Faure tires and red inner tubes are made in Akron, O., the casings being built with special fabric imported from France, the manufacturers claiming to be the only company in the United States to make tires in metric sizes. Both tires and tubes are made in all sizes from 815 by 105 millimeters to 935 by 110 in metric measurement and 32 by 4 to 38 by 5 1-2 in English sizes. The company's 935 by 135 is claimed to be the only metric oversize tire made. The company makes but one tread, the non-skid type shown at the right of the accompanying illustration. This is called the Never-Skid, and is strongly reinforced, the non-skid feature being obtained by the use of raised disks connected by narrow bars of rubber, all molded on the tread. The tread operates on the suction principle. There are two side bands extending circumferentially around the tire which are designed to prevent all side skidding. The casings are unusually large and heavy, the larger sizes being nearly 6 inches in diamter. According to the manufacturer only the highest grade of material is used in the construction of Faure tires.

Gaulois—Made in Four Treads

Gaulois tires are manufactured by the Etablissements Bergougnan in Clermont-Ferrand, France, and are handled in this country by the Gaulois Tire Corp., New York City. The tires are made as Q. D. and clincher in four treads, the steel studded, grooved—rubber, square and round, in all sizes from 50 by 65 millimeters to 935 by 135 millimeters and in English sizes from 28 by 3 to 37 by 5. Interchangeable sizes are made from 31 by 4 for 30 by 3 1-2 rim to 37 by 5 for the 36 by 4 1-2 rim. Gaulois inner tubes are also made in all these sizes. Three of the Gaulois treads are illustrated herewith, these being the grooved-rubber, the square-tread and the steel-studded types. According to the makers, the best grade of pure Para is used in the manufacture of both casings and tubes, while the fabric employed is claimed to be of the best quality and finest weave. The tread cover on the steel-studded type is of the best chrome-tanned leather. The non-skid or grooved-rubber tread which is illustrated herewith has a special pattern designed to prevent side-slipping as well as skidding, and is said to be highly efficient in securing traction under the most adverse road conditions. The Gaulois company also manufactures a complete line of accessories, including pumps, bags for spare inner tubes, rubber cement, blowout patches of all descriptions, tire levers, tire cases, air gauges and complete repair outfits.

Prowodnik—Two Non-Skid Types

The Prowodnik line of tires is manufactured at the works of the Prowodnik, Riga, Russia, and is handled in America by the "Columb" Tyres Import Co., New York City, which is a direct branch of the factory. The line comprises two types of shoe, both of the non-skid variety, and a complete line of inner tubes. Both tires and tubes are made in sizes from 30 by 3 up to 37 by 5 inches and from 810 by 90 millimeters up to 935 by 135 millimeters in metric sizes. The leader of the line is the Columb, a rubber non-skid having an extra heavy tread with segments cut on both sides to secure the non-skid feature and to prevent side-slipping. The other tread is of the steel-studded sort familiar in European tire construction, the heavy steel studs riveted to a chrome leather cover rendering it both durable and free from the possibility of skidding.

The principal feature of these casings is the construction of the core. The fabric used in this is impregnated by a special process with pure Para which gives the core the same degree of elasticity as the tread. Between the plies of fabric are layers of rubber compound binding the fabric together and securing resiliency. The gray rubber tubes manufactured by the Prowodnik works are all of heavy construction and are said to be unusually durable. The Prowodnik company claims to be the largest exporter of automobile tires in the world, sending its products not only to other countries of Europe and to America, but also to Australia, South Africa and other remote sections of the globe.

Considers Electric Lighting Systems Expensive and Inefficient

(*Continued from page* 301.)

gasoline cost as the only cost. As a matter of fact, the extra gasoline consumed by the generator is only one item. There are many other items which make electric lighting very much more expensive than acetylene lighting, and I think the experience of the great majority of dealers, garagemen and repairmen will bear this out.

But after all, there are other matters in connection with the discussion which are more important than even the item of expense. For instance, I should like to see a full discussion on the matter of reliability and quality of light, and I believe that many of your readers, and particularly the dealers, are in a position to furnish you a great deal of interesting matter on this subject.

It is my opinion that electric light is anything but reliable, and that the light from the electric headlight is inferior, as a real road light, to the acetylene light when used in a really good gas lamp.

After considerable study of all electric systems, and considerable experience in all kinds of electrical adjustments and repairs, I am convinced that the automobile owner who operates an electric system on his car, without being something of an electrician himself, will sooner or later have to face more trouble than he may get from all the other parts of the car combined.

A careful observer cannot fail to notice the increased weight and decreased efficiency of automobiles since the so-called electrical progress commenced. Bad as this tendency is, no correction of it seems possible so long as "electric progress" continues. The batteries used on cars today are hardly large enough for lights alone, and are too small for electric starters and other appliances which may later be saddled upon them.

I have made enough factory tests to know that the power loss and increased weight, due to generating electricity, are much greater than any manufacturer cares to admit.

Allow me to suggest another point of vital interest to dealers and garage owners. I recently went into the garage business in partnership with F. P. McLallen, who formerly traveled for the factory branch of a well-known automobile company.

We found that the average customer had an idea that electric systems had very few and simple troubles, easily repaired. The result was that when we put in several hours of good time making a repair the customer objected to the size of the bill. We are now referring all electric repairs to the dealer.

Repairs Are Difficult and Expensive

I further believe that when the cost of electrical service is placed where it really belongs, either on the shoulders of the owner or of the manufacturer of the equipment, there will be a decided change in the public attitude toward electricity. It seems to me that a discussion of some of the matters I have touched upon would be far more interesting and helpful, especially to the dealer and the garageman, than the one question of how much extra gasoline is consumed.—L. H. Condé, The Illinois Garage.

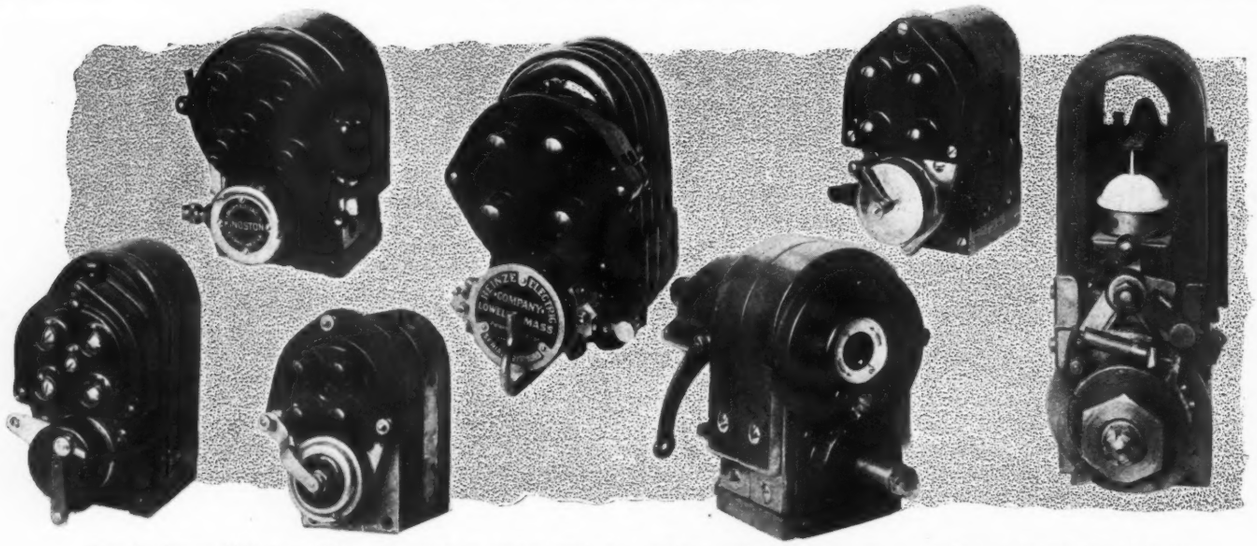


Fig. 1—Seven 1914 magnetos. Top, left to right, Kingston, Heinze, Sims; bottom, Remy, Splitdorf, National and K-W

Magnetos Improved in Minor Details

Makers Aim for Hotter Spark at Low Speeds and at Any Advance—Remy Drops Inductor Type

By J. Edward Schipper

RELIABILITY of ignition and the use of magnetos have gone hand in hand for some years back and it is therefore not surprising that further improvements in the magneto field involve nothing radical. Still, the past year has seen some improvements along three well-defined lines, these being faster breaker box mechanism, better waterproofing and a more intense spark at low speeds and at all degrees of advance.

The magneto is used in three principal ways, that is, in single, dual and double systems. In the single system which is rapidly gaining popularity, the magneto alone supplies ignition current. In the dual system a battery or magneto is used to furnish the ignition current. The battery and magneto systems are distinct and separate from one another with the exception of the spark plugs, only one set of these being used. The double system has the battery set and the magneto and employs two separate spark plug outfits. In addition to these three major systems there are others which are less important on account of the fact that fewer cars use them. The most noticeable of these is the two-spark system in which two spark plugs in the same cylinder are fired at the same time.

The magneto itself can be classified under two general heads, high-tension and low-tension. The high-tension machine has a primary and secondary winding on the armature, or, in other words, carries a self-contained high-tension coil. The low-tension machine merely uses a primary winding on the armature which generally consists of about 150 turns of wire having a sectional diameter of about .05 inch. The high-tension machine has the primary winding within the secondary winding. With the low-tension instrument, it is necessary to have an exterior coil to secure the high-tension spark at the plugs. A diagrammatic illustration of both systems is given in Fig 2.

General Principles of Operation

A magneto consists of two fundamental parts, the magnet and the armature. The magnets are made of hard steel because this

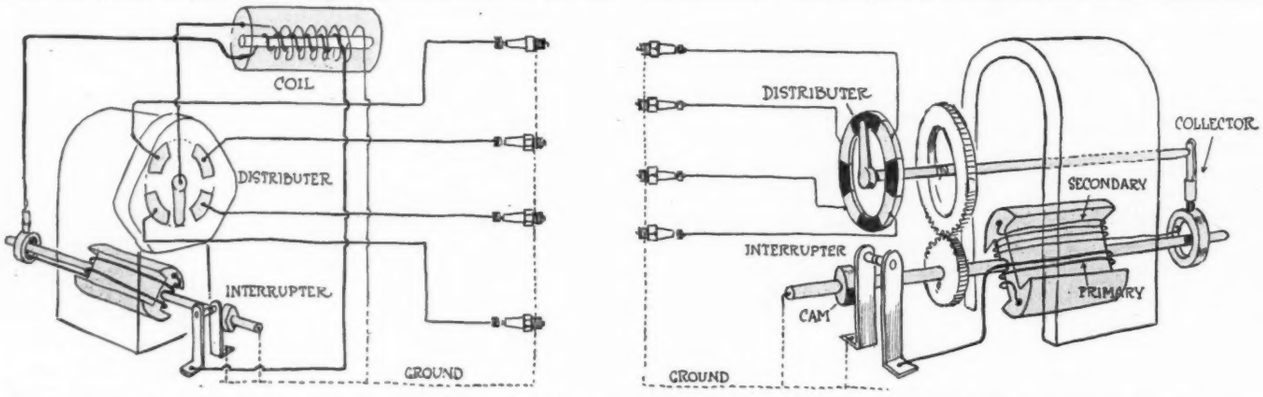


Fig. 2—Diagrammatic view of the two types of magneto. Left, low-tension, single winding on armature with independent coil for stepping up voltage. Right, high-tension magneto with primary and secondary windings on rotating armature

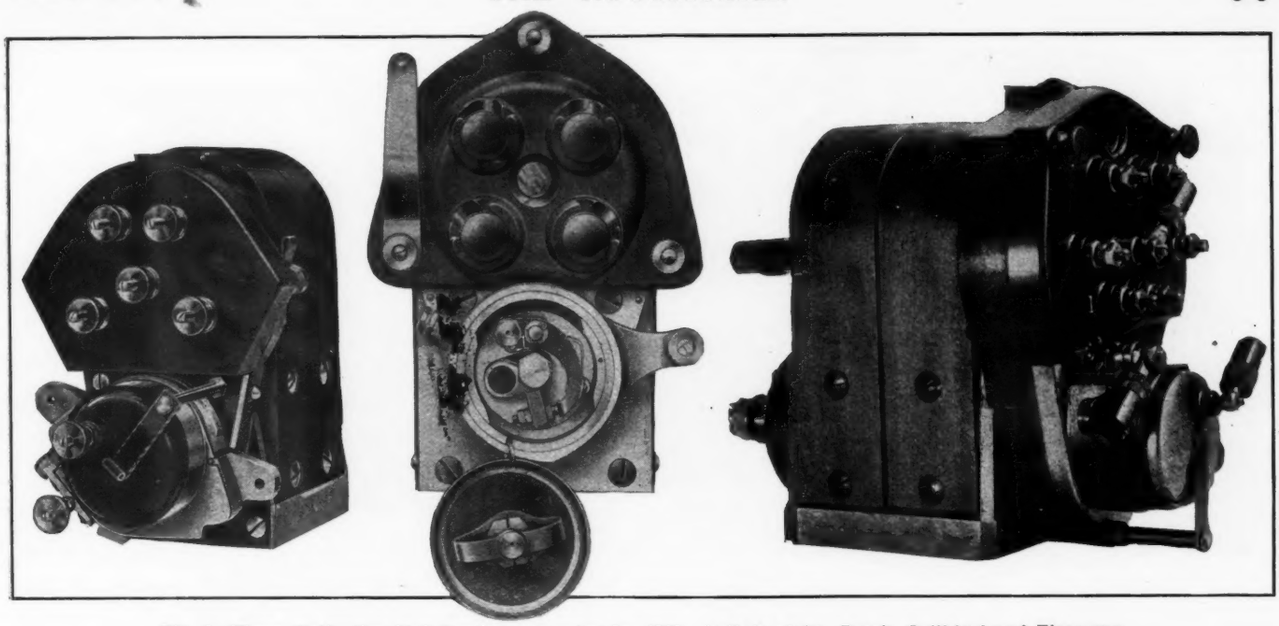


Fig. 3—Three distinctive high-tension magnetos for 1914. Left to right, Bosch, Splitdorf and Eisemann

material retains its magnetism longest. The armature consists of a soft iron core which carries the winding which may either, as explained above, be a low-tension one alone, or, a combined high-tension and low-tension. The low-tension winding consists of a number of turns of copper wire each layer of which is separated from the next by some insulating material. This winding, cutting the lines of magnetic force which flow between the magnet arms or poles, becomes charged with a current which is either high-tension or low-tension according to the winding. The voltage generated depends on the number of lines of magnetic force which are cut by the armature and therefore at one position of the armature, the maximum number of lines are cut and at that point the most intense spark can be created. It is therefore the object of magneto makers to have the spark occur as often as possible and under as many conditions as possible when the armature is in the position in which it cuts the greatest number of magnetic lines of force. This effort on the part of magneto makers gives rise to most of the changes of design from year to year.

Passing over the details of construction of the magneto, the current generated in the low-tension instrument is taken through an exterior coil and through the action of a circuit breaker the high-tension current is induced and by means of a distributer carried to the proper spark plug. In the high-tension instrument this mechanism is self-contained and by means of the breaker box, which is generally located on the end of the armature shaft, the low-tension current is broken and a high voltage created in the secondary winding. The sharpness with which the low-tension current is broken is one of the features which determine the strength of the high tension current, and therefore magneto makers are endeavoring to improve the breaker box mechanism in order to get the sharpest possible break.

Water breaks down insulation. A leaky insulation cuts down the number of effective turns of wire in the winding and therefore it is not surprising to note that the magneto makers are doing their utmost to make their product as waterproof as possible and herein lies the third line of improvement this year. With the points outlined above the reader may study in an intelligent manner what each of the makers are doing to produce a better magneto as far as efficiency is concerned in both an

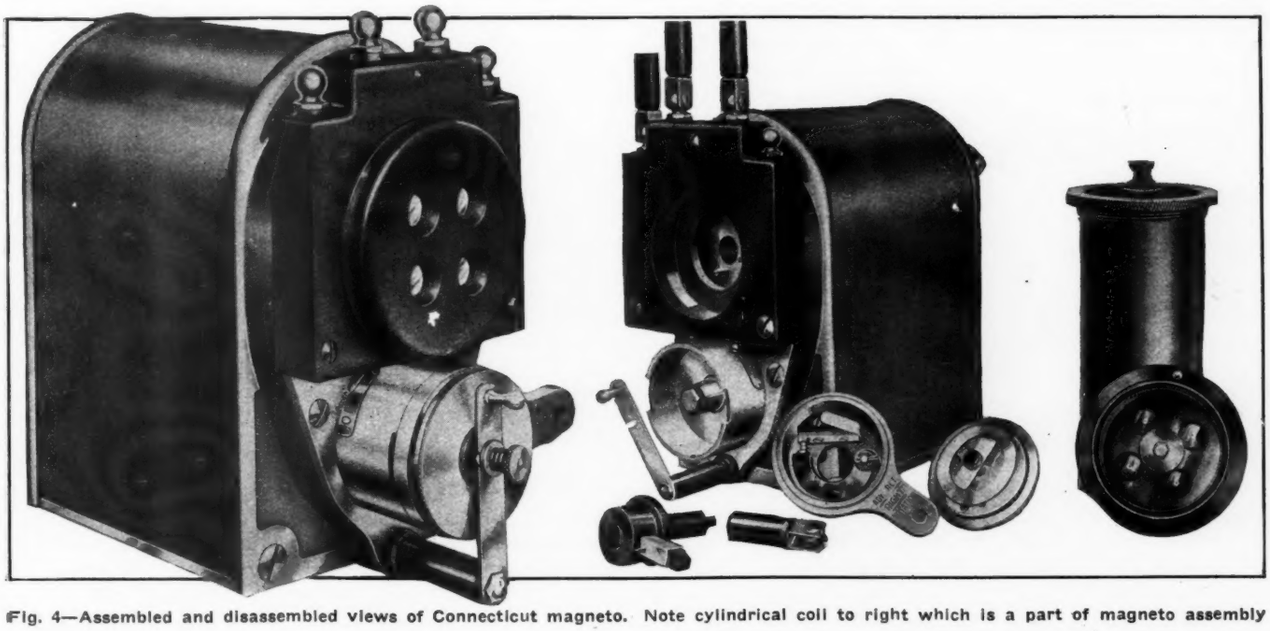


Fig. 4—Assembled and disassembled views of Connecticut magneto. Note cylindrical coil to right which is a part of magneto assembly

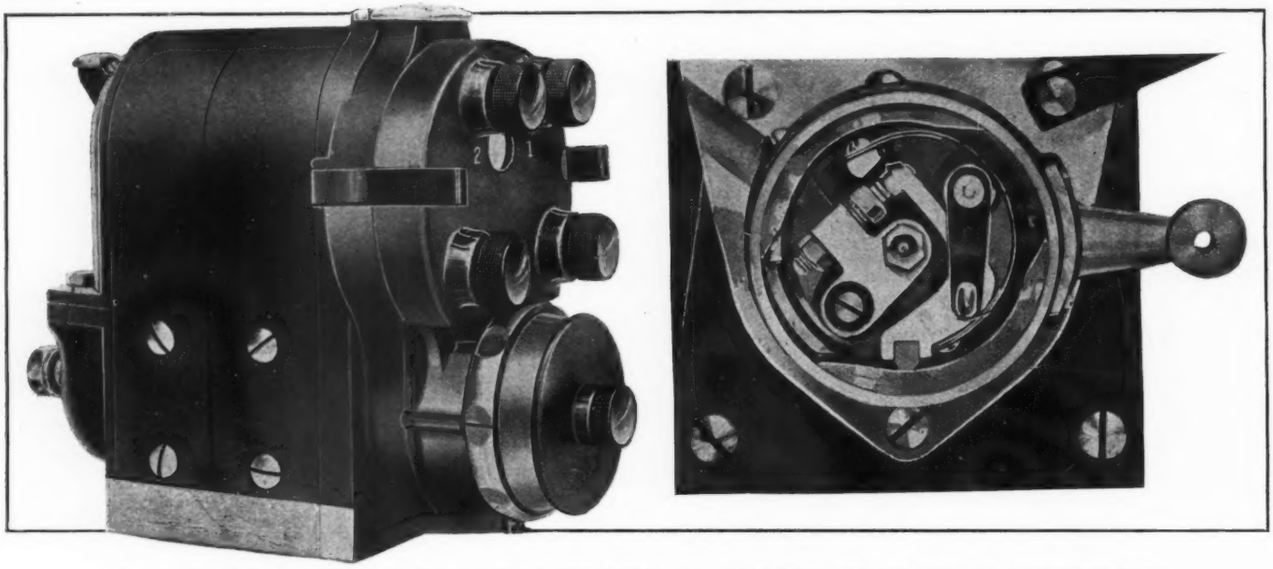


Fig. 5—Bosch independent magneto and Bosch DU4 breaker box mechanism, showing cam and interrupter lever

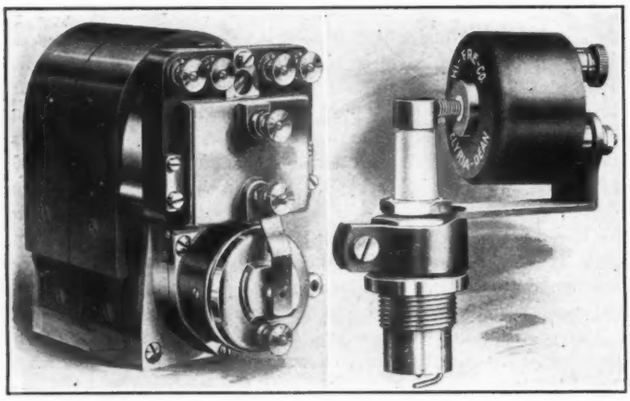


Fig. 6—Elyria Dean low-tension magneto and spark plug resonator

electrical and mechanical sense. One other feature should have attention. This is making the magneto to suit the particular class of vehicle for which it is intended as regards weight and size.

Bosch Line Practically Unchanged

The Bosch Magneto Co., Springfield, Mass., is making a line of high-tension magnetos which is noted for its completeness. The most popular types for automobile use are known as ZR, ZU, ZE and DU.

In order to produce a maximum spark at any rotative speed or at any timing advance, the pole pieces of this magneto are toothed, or slotted at their ends to give the appearance of a comb. Another feature of note concerning this type, is an accessible arrangement by which the timing of the magneto in relation to the motor may be controlled without removing any of the parts. Above the upper gear which drives the distributing mechanism there is a small glass peep hole through which the gear teeth may be seen. One of the teeth is marked and the edges of the rim holding the glass are also marked. These two marks should register when the crankshaft is turned so that cylinder No. 1 is in firing position at full advance and the magneto armature is in such a position that the figure 1 appears in the distributer window located in the front of the instrument near the top. In Fig. 5 the ZR-4 magneto is shown and the distributer window is between the numbers 1 and 2 on the distributer cover plate. The other windows for seeing the gear teeth become visible when the oil hole cover plate shown on the top of the magneto is raised.

The Bosch breaker mechanism remains unchanged. An illustration of that used on the DU-4 type is given in Fig. 5. This is a particularly rapid breaking mechanism, the action being contained through a cam that trips an interrupter lever which is carried on a spring. A new Bosch flexible coupling with an advance feature is shown in Fig. 7.

Briggs Drops One Model

The Briggs Magneto Co., Elkhart, Ind., has dropped one of the two models of magneto that was carried last year and this year is pinning its faith to one type which is known as the model C. The model dropped was the model A.

In general the Briggs magneto is of the low-tension type, having one primary winding on the armature core. The transformer coil is carried separately on the dash. The two horseshoe magnets are of tungsten magnet steel and the entire instrument is made in such standardized size that it may be substituted for any other make.

The breaker box mechanism has not been changed and the same material is used throughout. The breaker points are of platinum iridium which the makers state give long life when protected by the special type of condenser used on these instruments.

A feature of the Briggs magneto is the lubricating scheme which provides, by means of a 6-ounce tank, sufficient lubricant to take care of the wants of the magneto for 15,000 miles. In other words the magneto need be oiled but once a year The oil feeds automatically from this tank, which is located at the top of the instrument, to all the bearing surfaces throughout the machine. Another feature which the makers have taken care of is easy adjustment. The entire breaker mechanism can be detached from the magneto by removing a single nut.

If desired, an automatic feature will be provided with these magnetos. This is a centrifugal action by means of which the amount of advance is increased according to the rotative speed of the armature shaft of the magneto. The device is so designed that the spark occurs at the proper point at all rotative speeds. In an addition to the automatic advance, the Briggs company continues to market the flexible coupling which has been a part of their line for the past 3 years. This coupling is shown in Fig. 10.

Connecticut Makes Two Types

For 1914 the Connecticut Telephone & Electric Co., Meriden, Conn., continues to market the same line of magnetos as for 1913. No changes whatever have been made.

The Connecticut magnetos are made in two types, independent and dual. They are adaptable to four- and six-cylinder engines.

The Connecticut magneto, while a self-contained high-tension instrument, does not carry two windings to the armature. Instead the transformer coil is mounted above the armature shaft between the magnets giving a complete high-tension instrument without the double-wound armature. A complete view of the assembly of the Connecticut magneto is given in Fig. 4. The transformer coil, which is of cylindrical shape is shown to the right of the magneto casing. It is incased in a metal tube which is threaded at the outer end so that it can be screwed directly into the magneto.

The material used in the Connecticut is the same as in the past. Brass castings are used for the base, front and rear frames, interruptor housing and front bearing retainer. The armature heads, gears and other rigid parts are of bronze.

Dean Brings Out Improved Type

The Dean Electric Co., Elyria, O., is making a type of ignition apparatus which differs materially from any other on the market. It is distinguished by the fact that all the wiring carries comparatively low voltage and that the voltage is stepped up in a resonator which is mounted adjacent to the spark plug. This magneto is furnished for a single system in which a single-contact, short-circuiting switch is the only dash instrument having anything to do with the ignition. It is also manufactured in a dual system in which a cylindrical step-up coil is mounted on the dash in conjunction with the ignition switch.

The system is best studied by a wiring diagram and this is furnished in Fig. 15, which shows the layout of the dual system. The high frequency single system consists of a low tension magneto with a breaker box and a low-tension distributer. The individual primary wires lead from the distributer to the resonators. The only other wire used is that leading to the short-circuiting switch on the dash. The reason the resonators are placed close to the spark plugs is to avoid losses of energy through voltage drops in long wires.

The dual systems employs the same elements as the single system with the addition of a combined dash coil, condenser and switch as shown in the wiring diagram, Fig. 15. The magneto is used for regular ignition and current from a 6-volt battery is kept as a reserve. The dash coil is of a plain winding of coarse wire over a core of soft iron wire. The switch is used for connecting either the armature or the battery circuit through the breaker box and condenser. A push button is also provided for starting the engine on spark.

The resonators are simple transformers of what is known as the Tesla type, having no magnetic cores. A secondary winding of 1,200 turns of number 36 wire is first applied to the spool, then a primary of seven and one-half turns of number 19 wire. Each winding is separated from the next by paper and the entire unit is protected by compositions rendering it electrically non-conductive and proof against moisture, oil and heat

Two New Eisemanns for 1914

Two new models for 1914 have been brought out by the Eisemann Magneto Co., Brooklyn, N. Y. These new models are known as EMA and EMAR and are only different from the model EM of last year in that they incorporate an automatic advance feature. The Eisemann line is now made up as follows:

Types EM, EMA, EUA and EDA for 1-, 2-, 3-, 4-, 6-, and 8-cylinder motors. These are single ignition instruments. Types EMR, EMAR, EUAR and EDAR for 3-, 4-, 6- and 8-cylinder motors and Type EB for four-cylinder motors only.

The EB is the only magneto made by the Eisemann company which does not carry both a primary and a secondary winding on the armature. In this model there is only a low-tension winding on the armature and the step-up coil is carried separately. As a general rule it is mounted on the dash.

No changes have been made in the mechanical features of the Eisemann magneto with the single exception of the addition of the automatic advance feature to the two models mentioned. The breaker box mechanism remains the same as formerly and the composition of the platinum points has not been altered. In the way of waterproofing there is a waterproof distributer plate which can be used on all models.

It is generally in the arrangement of the pole pieces that the high-tension magnetos differ materially from one another and in this respect Eisemann construction is unique. These pole pieces differ from ordinary design in that they are tapered to lie

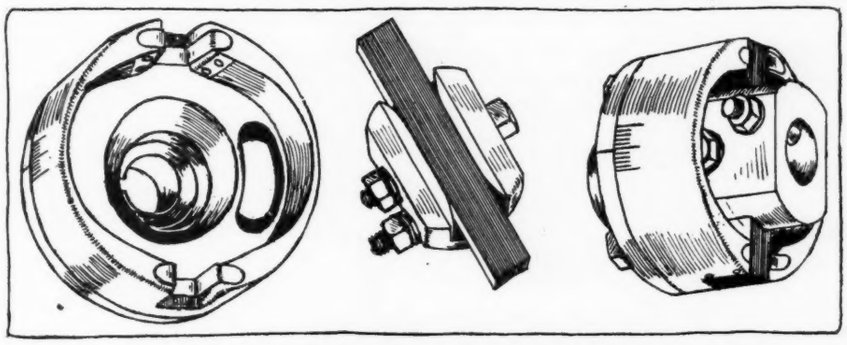


Fig. 7—New Bosch flexible magneto coupling embodying advance feature

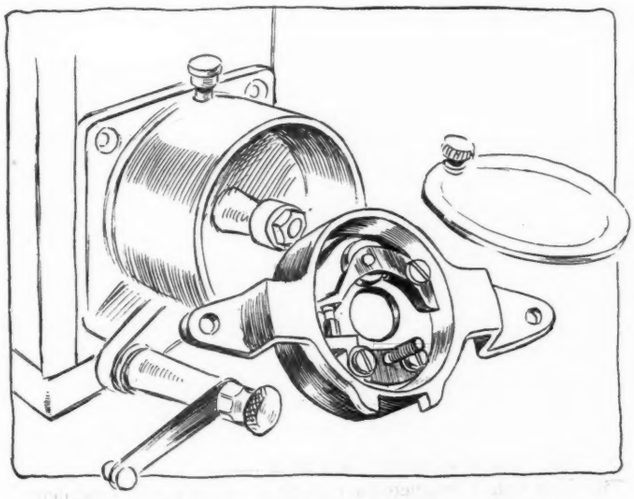


Fig. 8—Breaker mechanism of the K-W instrument

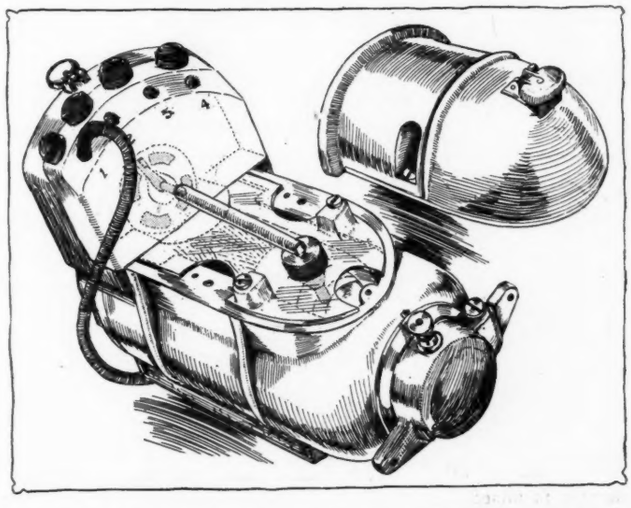


Fig. 9—Phantom view of the new Mea waterproof magneto

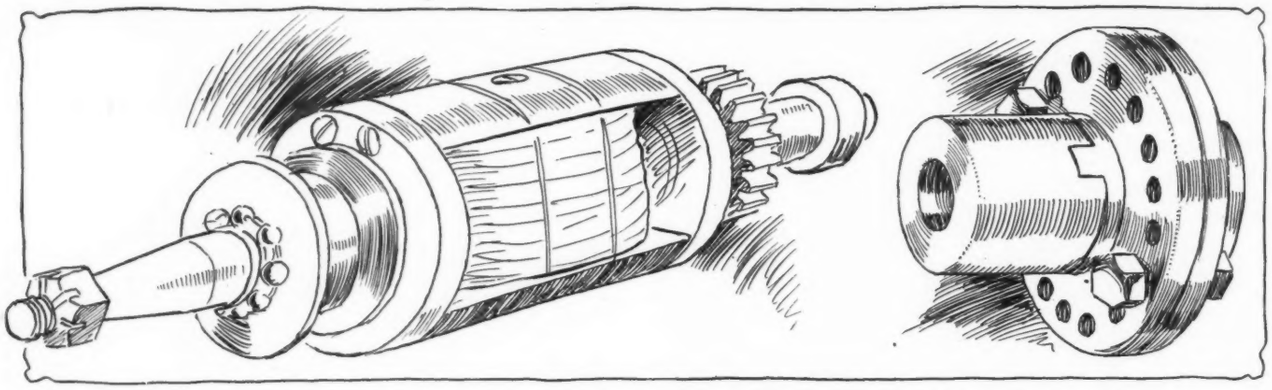


Fig. 10—New shuttle-wound armature of Remy magneto, which displaces inductor. Briggs magneto coupling

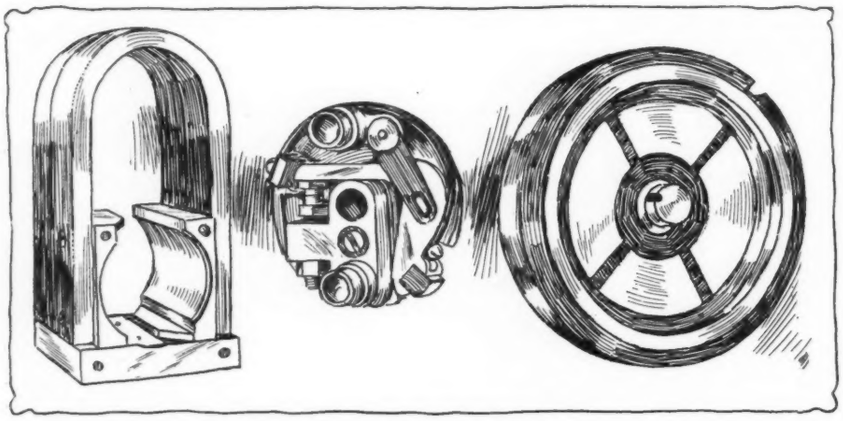


Fig. 11—Simms pole pieces, breaker box and commutator

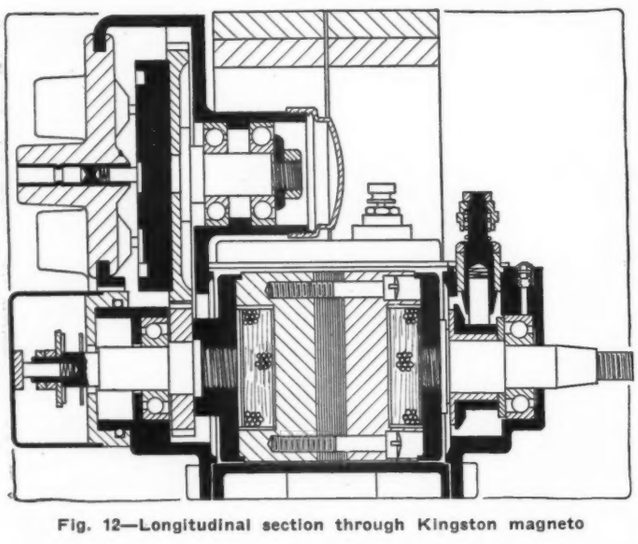


Fig. 12—Longitudinal section through Kingston magneto

approximately in the plane of the theoretical axis of the core of the armature. This is said to prevent the diffusion of the lines of magnetic force and hence to increase the intensity of the induced spark on account of the cutting of more magnetic lines of force by the armature. The shape of the armature and its size is such that at no time is it entirely separate from the magnets. This is so arranged with the idea of having the armature act as a keeper for the magnets and therefore to prolong their life.

Ericsson Has Cyclecar Magneto

Under the name of type N, the Ericsson Mfg. Co. has brought out a new high-tension magneto which contains both windings on the armature. It is a waterproof design and the armature is so enclosed that it is claimed the magneto can operate without fear of moisture. The setting of the timing has been improved in this magneto and the design has been so arranged as to render it impossible for missing to occur through the sticking of the interrupter arm. The frame is in a solid unit and the interrupter cams are solid with the housing. This is a distinct cyclecar magneto although it can be used on other small cars.

Heinze Continues Low-Tension Type

The Heinze Magneto Co., Lowell, Mass., is continuing the manufacture of their low-tension magnetos which are distinguished by the fact that the magnets are circular in section. The change made last year of grounding both ends of the primary winding is continued. The instrument is made up for four- and six-cylinder engines and its breaker mechanism, etc., has not been changed.

The secondary winding of the Heinze magneto is not carried as a unit with the instrument, but is mounted on the dash. According to the Heinze company the object of using the round instead of flat-sectioned magnets is because a better contact can be secured with the pole pieces. The contact is secured by grinding the ends of the magnets and reaming the holes in the pole pieces so that a secure fit is given. The material used in the magneto is tungsten steel. The breaker box cover is made of steel tubing with fiber insulation which is shrunk on the outside of the steel.

Herz Adds New Magnetos

The line of Herz & Co., New York City, has undergone considerable refinement for the 1914 season. This company has taken cognizance of the cyclecar wave and has brought out a special magneto which is adapted for this type of car. Another magneto which has been added to the line is specially adapted to take care of the two-cylinder cyclecars. The small four-cylinder type, which is known as 4-U-4 is of special interest due to its small, compact design. Although a highly efficient machine, its weight is but 9.5 pounds.

The distributer disk on this type of magneto differs from previous designs in that the secondary terminals are attached to the sides instead of to the top.

All magnetos made by the Herz company are of the high-tension type, having two windings on the armature, but in the latter types which were first sold this year there has been some change in the breaker box mechanism and also in making the instruments more thoroughly waterproof. The change in the breaker box mechanism does not involve any alterations in the operation of the device but the platinum points have been made

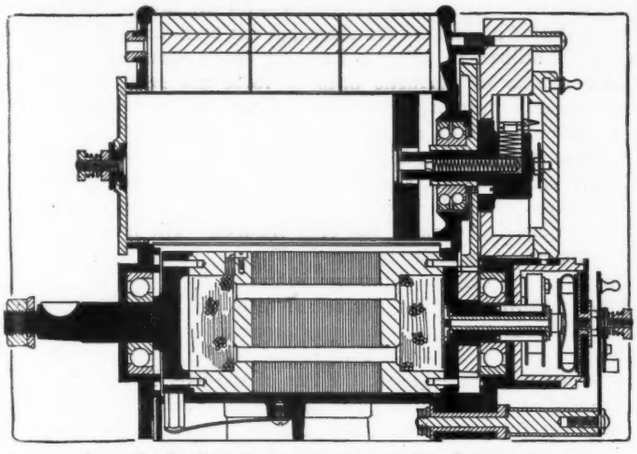


Fig. 13—Section through center of the Connecticut

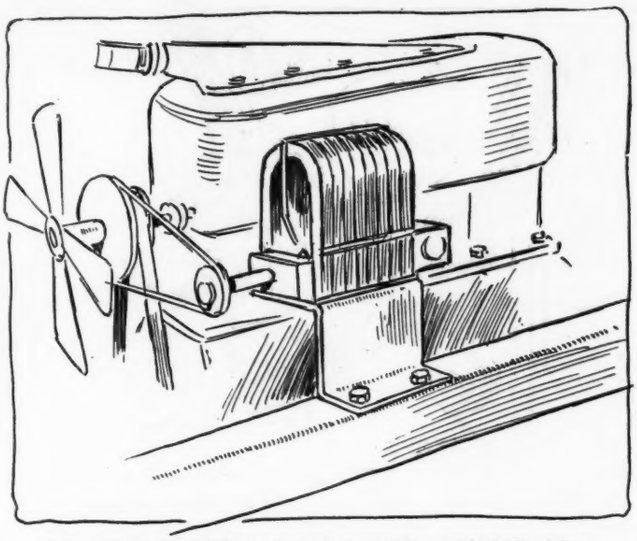


Fig. 14—Holtzer-Cabot current generator with belt drive

larger with an eye to increasing their durability. Along the same line of durability the segment box is made of heavier material and the shoulder of the bearing box which carries the segment of distributer box has been lengthened to give the latter a more firm support.

The timing advance lever is stronger and of heavier material and is now fastened to the distributer housing with two screws instead of one. A more rigid connection of the steel segments to the segment box is another feature of this year's magneto.

Along the lines of automatic advance the Herz company has been working consistently. The company is now prepared to furnish any of the automobile magnetos with this type of advance, so arranged as to follow any degree of advance at any speed within reasonable limits. The automatic advance device consists of two disks which are brought face to face with six grooves having a spiral twist. Each of these grooves contains a ball so that there are six balls between the two disks. When the disks revolve, the balls tend to move around in the spiral grooves and create a twist which provides the advance.

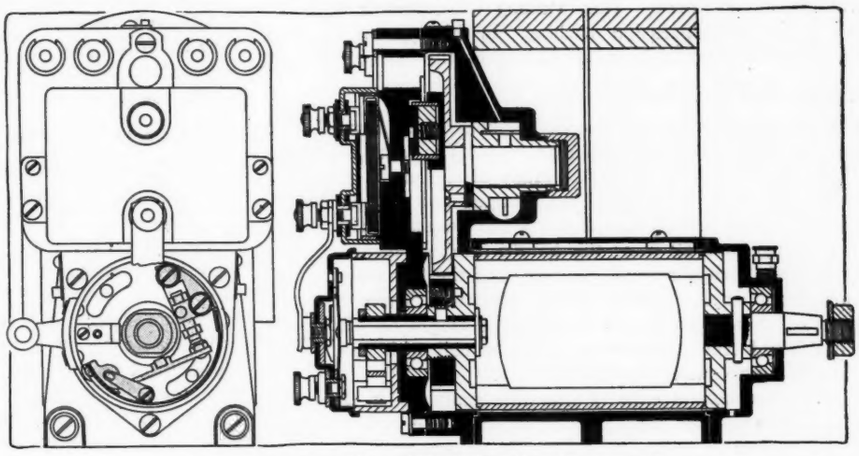


Fig. 15—Section through Dean low-tension magneto

Holtzer Cabot a Direct-Current Machine

The Holtzer Cabot Electric Co., Brookline, Mass., is producing a machine which it calls a magneto-generator because it not only fulfills the purposes of a magneto in furnishing ignition current, but also provides the source of current for an electric lighting system. This instrument can be mounted on any car and driven by belt in the manner shown in Fig. 14. The principle of the device and its mode of operation have been described under the head of Lighting Generators in THE AUTOMOBILE for January 15.

K. W. Adds Impulse Starting Device

A complete line of both high-tension and low-tension magnetos is made by the K. W. Ignition Co., Cleveland, Ohio. For the 1914 season no great changes have been made in the line of magnetos suitable for automobile use except that the high-tension model H instruments will now be furnished with an impulse starting device.

The impulse starting device is a spring-operated mechanism which when released spins the armature and gives a spark which should start the motor. The method of operating this device and of correctly setting the trigger is to place the circuit breaker in retard position so that when the tripping device ceases to operate the spark will not be too early. The device operates on a spring and ratchet principle. A dog picks up the ratchet and when the motor is turned the magneto does not revolve until a sudden cam release causes it to spring around giving a hot spark, thus firing the engine regardless of how slowly the crank is turned.

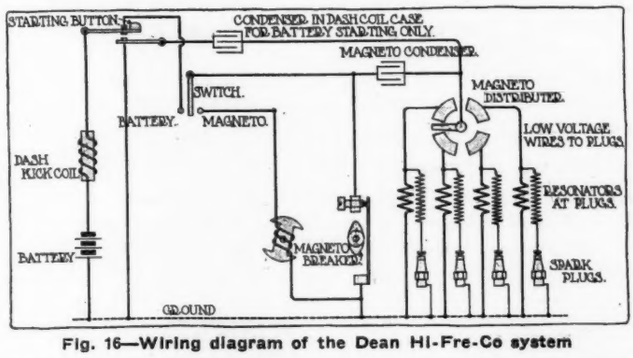


Fig. 16—Wiring diagram of the Dean Hi-Fre-Co system

A noteworthy feature of K. W. magnetos is that the windings are entirely separate from the armature and are stationary. The winding is concentric with the armature shaft and is mounted between two halves of a rotor. The rotors collect the magnetism from one pole piece and conduct it through the center of the winding to the opposite pole-piece, thus generating the current. The winding on the high-tension type includes both the primary and the secondary, the primary part of the winding has its current interrupted by a circuit breaker shown in Fig. 8.

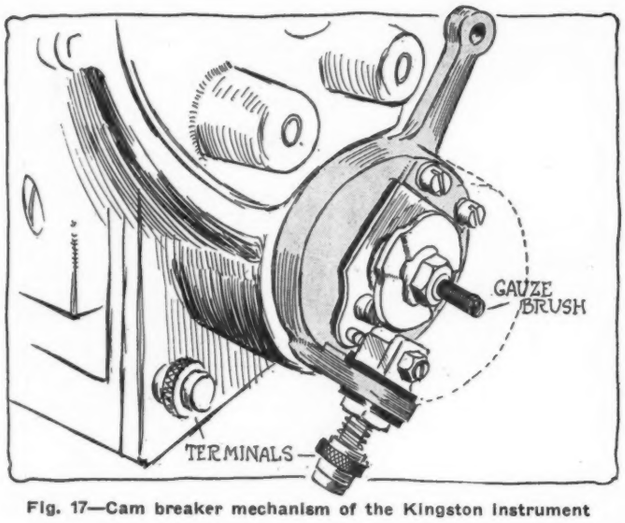


Fig. 17—Cam breaker mechanism of the Kingston instrument

On the low-tension K. W. magnetos the winding is a stationary spiral of copper ribbon. This winding is concentric with the rotor as in the high-tension machine. In this type of magneto the induction or secondary coil is carried on the dash of the car.

Kingston Has New Breaker Box

For 1914 the Kokomo Electric Co., Kokomo, Ind., is marketing a total of twenty-two different magnetos. The main difference in these, however, is in the size. Many of the model names of the Kingston magnetos have been changed and this is due to the fact that an entirely new breaker box mechanism has been added for 1914 and all using this have a different name.

In general the Kingston magnetos are of the low-tension type, having but a single winding on the armature. Three types of step-up coils are sold for use with these magnetos. They are the dashboard type with switch, the tube coil with switch and the box coil with switch separate.

The breaker box is entirely new this year. It is shown in Fig. 17. As will be seen, contact between the two platinum points is broken by means of a flat cam so arranged that a depression in its surface bears on a fiber-tipped follower twice for every revolution of the armature shaft. The follower is mounted on the same piece of spring steel as the movable platinum point and when this is depressed the points are separated. The breaking action takes place in a line parallel to the axis of the armature shaft, that is inwards and outwards, facing the distributer plate of the magneto.

Mea Different in Appearance

Marburg Bros. Inc., New York City, have produced a machine which differs entirely in external appearance from the Mea magnetos of previous years although the old Mea principle of bell-shaped magnets, which together with the breaker mechanism is shifted around the armature, has not been changed. This principle is utilized in order to have the spark occur when the greatest number of magnetic lines of force are being broken by the armature winding, regardless of the time at which the spark occurs in relation to the stroke of the engine.

The Mea magneto is a high-tension instrument carrying both a primary and a secondary winding on the same armature. This year it is seen in highly waterproof form, this being the reason that the exterior appearance has been changed. The new magneto is illustrated in skeleton form in Fig. 9. As will be noted this magneto is a distinctly inclosed design.

Another improvement for this season is in the breaker mechanism. Whereas the points formerly separated in a horizontal direction, they now break in a perpendicular line. That is the break occurs at right angles to the line of the axis of the magneto instead of parallel to it. The number of brushes necessary has been cut from three to two in the distributer finger. The scheme now used consists simply in having one brush take the current from the armature to the axial point of the distributer finger and the other brush is at the radial point of the distributer finger and through wiping contact applies the current to each of the four points on the distributer plate leading to the spark plugs.

Although the timing range of the magneto is not so great this year as in the past—45 degrees as compared to 70 degrees—the latter amount was found to be more than 75 per cent. of the people using magnetos would employ.

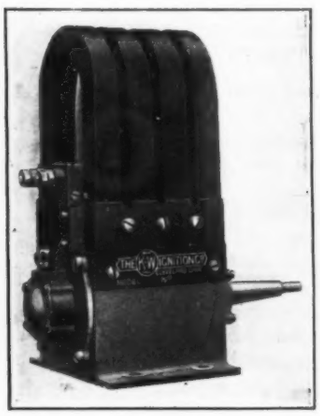
Remy Drops Inductor Design

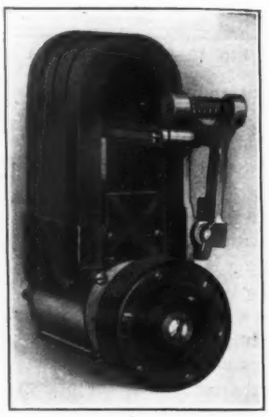
Four models of magnetos are made by the Remy Electric Co., Anderson, Ind., for 1914. They are known as P, 30, 31 and 32. They are made for two, four and six-cylinder engines with single and double distributers. All these magnetos differ from their predecessors in that they use the rotating armature in place of the inductor type. For this reason all Remy magnetos are now found with a single winding on the armature.

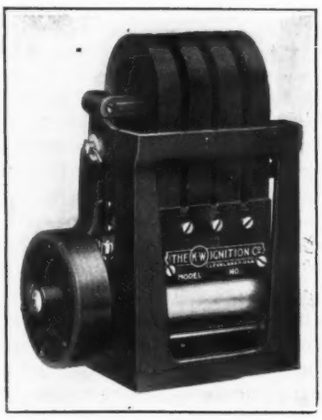
At the same time that the Remy company has changed from the inductor to the low-tension type of magneto, it has provided coils for use with these machines and they are adaptable either for the dash or they may be fitted to the engine base. The dash coil is fitted with an integral switch, the face of which only appears through the dash. The engine base coil is a separate unit within itself. It is mounted on the crankcase or in any convenient place in close proximity to the magneto. It is supplied with a separate switch which provides the usual three positions, namely; battery, off and magneto.

A new breaker box design is used in this year's Remy with an idea toward getting a faster break and at the same time of having it readily accessible. The entire circuit breaker box can be removed without the aid of tools. The action of the breaker box is by means of a simple cam of chrome nickel steel. The points are a platinum iridium combination.

The distributer is an improvement over earlier models in that







Three K-W Magnetos

These three magnetos are of the low-tension type and are the same in general design, being intended for ignition in connection with coil and timer and for lighting work. The one at the left is gear driven and the other two are frictionally driven from the flywheel. Adjustment of the friction pulley is automatically maintained by a spring

it has been rendered more waterproof and it is now provided with packing to prevent leakage. The distributer also differs from previous Remy magnetos in that it is provided with a wipe contact in place of the open gap previously used. No automatic advance features are used.

Simms Magneto Remains Unchanged

The Simms Magneto Co., East Orange, N. J., is continuing its line of independent and dual magnetos without change. These magnetos are high-tension types and have the common feature of possessing two magnets. Both the windings are carried on the armature in these magnetos in the customary manner for high-tension instruments. A fixed spark will be provided if desired on the single type of magneto and in this case it is fitted with a stationary cam ring. However, unless otherwise specified, the Simms magneto is provided with facilities for a 30-degree advance.

The feature of the Simms magneto which renders it distinctive from any other high-tension type is the fact that the pole pieces are notched back from the center for the purpose of concentrating the lines of magnetic force at the extreme pole ends and thus producing an intensified spark. This type of pole shoe is supplied in both the single and dual instruments, but on the fixed spark magnetos the ordinary straight form of pole shoe is used. Great care is given in waterproofing these machines.

Splitdorf Has a New Magneto

The Splitdorf Electrical Co., Newark, N. J., has put out for 1914 a brand new magneto. It is of the high-tension type and is known as the EU-4. A special feature of this magneto is its waterproof and dustproof design. It is adapted to motors up to about 30 horsepower.

Construction of this new magneto embodies an aluminum base to which the pole pieces are secured and between which revolves an armature carrying both the high-tension and low-tension winding. Mounted over the armature a condenser is clamped between two metal plates which are fastened to the pole pieces. The magnets are tungsten steel and straddle the pole pieces. The whole machine is housed by an aluminum cover fitting tightly over the end plates providing protection against dust and moisture.

The circuit breaker is attached to the armature shaft and revolves with it. The design of the mechanism is such that the platinum points come in contact with one another in a positive manner at a high speed due to centrifugal action. This permits the use of a weaker spring and lessens the wear on the cams. One end of the breaker arm supports a fiber roller which is adjustable for wear. This roller comes in contact with a steel cam causing the primary circuit to break. The spark, of course, is induced the instant of this break. The cam holder can be shifted to the extent of 23 degrees advance.

For attachment to Ford cars the Splitdorf company has an ingenious scheme by means of which the owner can apply his own Splitdorf magneto. A feature of the new magneto is in the breaker box cover which now contains the condenser on some models. On these the brush design is different owing to the fact that the condenser takes up some of the space. The Splitdorf company claims that there is less current lag when the condenser is placed in the position just described.

National Continues Double System

The National Coil Co., Lansing, Mich., is continuing a double ignition magneto system. In this system a special transformer coil is used which is mounted close to the magneto in order to avoid long lines carrying high-tension current. The coil operates with a 6-volt battery. The magneto is shown in Fig. 1. It has two magnets and carries the distributer and breaker box mechanism in the usual manner. The magneto carries the condenser and has a special oiling chamber which contains .25 ounce of lubricant. In order to facilitate timing a window in the distributer housing indicates which plug is firing.

The Use of Recording Meters

As Applied for Testing the Electric System of an Automobile as Well as the Engine

Being Digests of Papers Read Before the Indiana Section of the Society of Automobile Engineers by C. E. Hansell and J. W. Esterline, of the Esterline Co.

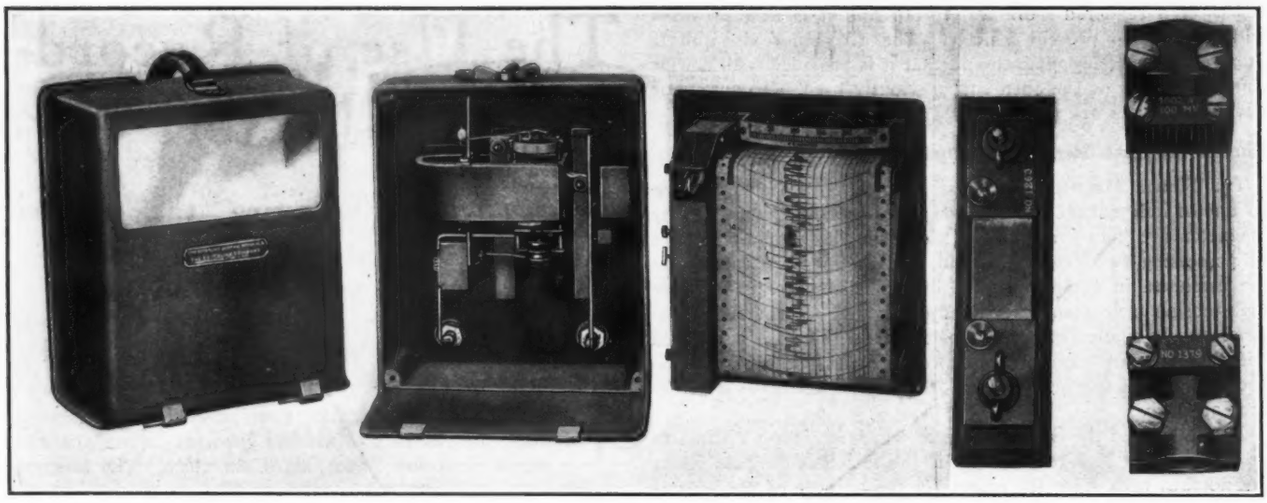
THE graphic meter consists essentially of three elements: First, the electrical measuring element; second, the writing or recording device; third, the clock. The functions of these three elements are as follows: The meter, or measuring element, Fig. 1, is a standard electrical measuring device exactly similar in principle of design and operation to the electrical measuring elements in switchboard and portable type indicating meters. This is provided with a pointer, at the end of which is carried a writing point. The measuring element controls the pen in such a way that the position of the latter corresponds to the quantity being measured.

The record chart, which consists of a strip of paper 6 inches in width, is drawn under the writing point at a constant speed by the clock. As the chart or paper tape passes under the pen-point a curve is traced in ink on the paper.

Rate of Travel Can Be Altered

The rate of travel of the chart can be altered to suit conditions of particular circuits on which the instrument is being operated. If the load to be measured is comparatively constant and a week's record is desired, the paper would be moved at 1 1-2 or 3 inches per hour. If the load is extremely variable and it is desired to record accurately all fluctuations, the paper can be operated at 3 to 12 inches per minute. This spreads the curve out over a longer space and makes it very much more easily interpreted.

Fig. 1—Esterline graphic ammeter. This instrument is used in testing electrical automobile equipment. It combines an ordinary indicating meter with a chart operated by a clock movement



Esterline graphic ammeter. From left to right: View of complete instrument; electrical measuring apparatus, clock and recording mechanism removed; clock and recording mechanism; two types of shunts used in connection with the graphic ammeter

The curve produced on the chart is of such nature that the height represents the amount of load in the circuit, while the time divisions along the margin give the time in hours or minute. Therefore, by reference to the curve it is possible to determine the amount of load in the circuit at any time or the actual variations in load for a given number of minutes may be quickly obtained.

There is nothing complicated, strange or peculiar about the graphic instrument. It merely automatically records instantaneous values of load just the same as an observer might mark down readings on a piece of paper as taken from ordinary indicating instruments. The difference, of course, is that the graphic instrument makes a continuous record, catching the minutest change in condition, automatically performing the operation.

These recorders are used for all sorts of work, in keeping track of printing presses, testing motors in shop equipment, analyzing machine tool operations, recording the temperature for annealing and hardening furnaces, etc. The following paper by J. W. Esterline outlines a special application of one of the standard instruments described.—C. E. HANSELL.

Electrical Tests of the Automobile—Esterline

During the past 2 or 3 years a number of auxiliary electrical devices have been added to the gasoline motor car, with a view to increasing the safety and convenience of operating. Notable among these is the electric lighting generator, the electric motor for cranking the engine, the electric means of shifting transmission gears, and now electric brakes are being proposed. The electric lighting generator and the starting motor were virtually forced upon the majority of the motor car manufacturers by the pressure of public demand, and at a time and under circumstances when the manufacturers of electrical apparatus were scarcely able to adequately meet the demands, nor were the manufacturers of motor cars given the necessary time nor had they the equipment in the way of experienced electrical men to care adequately for the installation and operation of such an elaborate accessory as a complete electrical lighting and power plant on a motor car.

In many cases the work of the manufacturer of motor cars had proceeded to a point where it was with the greatest difficulty that he could apply this auxiliary apparatus to the car in a manner which would insure satisfactory operation, and, as is always the result under such circumstances, there were some causes for criticism, poorly done, half baked jobs sent out, and a question as to the reliability and ultimate success of electrical apparatus on a motor car was raised in the minds of a good many people, both among the purchasing public and the manufacturer of motor cars.

Granting that the maker of electrical equipment does his work well, and carefully tests his equipment before delivery to the motor car company, there are still a number of precautions which the builder of the car will do well to observe, in order to insure the satisfactory operation of the entire equipment. As a rule, when anything is wrong with a well-made electrical device, it is some small trouble or defect, so small in fact that it is difficult to find. A bit of lacquer in a connected joint; a poor job of soldering; a cracked battery jar, or a bit of dirt under a brush or in a switch contact, such as these may be the cause of difficulty in operation.

Some manufacturers of a large number of motor cars recognizing the fact that where a great number of equipments are installed, that a final and conclusive test of each equipment, under conditions where actual results obtained and not the opinion of the operator should be the basis of acceptance or rejection, have sought means of making these tests rapidly and accurately by the use of recording meters.

The electric lighting-starting equipment on a gasoline car consists essentially of the following units in one form or another: Generator, battery, starting motor, lamps, wiring and the necessary switches. When the generator is being operated the current flows over into the battery or the lights or both; when the lights are lit and the generator is at rest, the current flows from the battery when the motor is cranked the current is likewise taken from the battery.

Test Can Be Made in a Few Minutes

Mr. Hansell has shown how a current in a circuit is measured by placing a shunt in the circuit with the ammeter connected across the shunt. When a car has been completed, the battery installed, the road test made and the electrical workmanship inspected, a final test of the operation of the electrical system can be made in a few minutes, making a permanent record of the following data:

1. Current delivered to the battery by the generator at all speeds from zero to full throttle.
2. Current drawn by lamps.
3. Initial current drawn by the starting motor.
4. Current drawn by the starting motor, spinning the engine.
5. Current drawn by the battery ignition.
6. Current used by the electric horn.
7. Operation of the gear shift, if such is used.
8. Leakage of current from grounds if any one of the switches are open.

By making these various records in succession a complete record of the operation of the electrical apparatus of the car can be made in 5 minutes.

A shunt of the proper capacity for the generator current is placed in the circuit to the battery with the engine rotating below the cutting-in speed of the generator. With the chart in motion the speed of the engine is increased at a uniform rate up to the maximum and then gradually reduced to zero. The current, at the instant of cutting-in, as the speed is increased and at cutting-out as the speed is decreased, gives an indication of the adjustment of the relay. The current curve between these two points is an unfailing record of the generator output throughout the range of operation of the car.

With the engine at rest the lamps are lighted and extinguished, the horn and other auxiliaries operated, making a permanent record of the performance of each of these devices.

One shunt is sufficient for making all the records on the generator and other auxiliaries with the exception of the starting motor. When these records have been made, the small shunt is replaced by one of sufficient capacity to carry the initial starting current and with all other switches open the starting

motor is put in operation. If a resistance type starter is used in connection with a flywheel pinion, the initial record is made showing the current consumption of the motor and gear reduction only, which in cases of poor alignment or imperfectly assembled gears, may be important. When the gear is pushed into place, the record shows the initial current required to start the motor, the number of compressions necessary to obtain cranking speed and the current drawn by the motor.

Record Reveals Minute Defects

It is almost impossible for us to state the number of defects of different character, which cannot be detected or observed by visual inspection of the equipment in operation, which a record of this kind will show up, especially after a series of standards based upon tests of a number of equipments of the same type, has been established.

A few examples will suffice to show the variety of minor difficulties which may be detected.

1. Proper adjustment of relay.
2. Reduction in generator output at high speed due to insufficient brush pressure or incorrect brush setting.
3. Chattering of generator brushes due to insufficient pressure or untrue commutator at high speeds.
4. Low generator output for any reason whatever.
5. Excessive generator output for any reason whatever.
6. The proper connections to all lamps as evidenced by the current drawn by the lamp load.
7. Absence of leakage current through grounds or improper connection as shown by zero current when all switches are open.
8. Proper volume of current drawn by battery ignition circuit.
9. Correct value of current taken by electric horn.
10. Free working of gear shift as shown by current required.
11. Free operation of starting gears.
12. Abnormal maximum current required to turn over engine.
13. Number of compressions required to obtain full speed.
14. Number of revolutions required to affect ignition.
15. Current required to crank the engine.
16. Number of revolutions per minute, cranking speed.
17. Detection of any condition in battery or connections which affect the operation of the starter.

In using the starting motor simply as a means of obtaining readings on the engine, it is advisable to apply a voltage sufficient only to crank at a speed which is not sufficiently high to introduce the effect of momentum.

It is to be expected that the torque application to six-cylinder motors will be more uniform than in four-cylinder engines, but there is considerable variation in the compression curves of the same motor and of different motors of the same type as shown by the accompanying curves.

To demonstrate the various uses to which the graphic ammeter can be put I will now show you some test curves and for the sake of easy reference to them I will call them number one, number two, etc., in the order that they are mentioned.

Number one is from a four-cylinder motor, 3 7-8 inch bore, 5 inch stroke, operated by a 6-volt separate unit motor. This curve was taken with a chart feed of 12 inches per minute and indicates that the current required to start the motor and gears only was 65 amperes; the initial current required to turn over the engine was 230 amperes while the average current to crank the motor was about 110 amperes. It will be noticed, also, that the maximum current over several compressions is different for each of the four cylinders.

Number two somewhat blotted, is also a curve of a four-cylinder engine of another manufacture, the cylinder dimensions being 4 by 4½. This engine is also operated by a 6-volt motor of the separate unit type. The examination of this curve shows that the operation of three of the cylinders is almost uniform, whereas the fourth is considerably different. It should be said that were this engine driven at a slower speed, the variation would be still more marked, as the effect of momentum at the cranking speed, 102 revolutions per minute, was considerable.

Number three is from a four-cylinder engine, but cranked by a 12-volt motor of the separate unit type. The very large variations in current are due to the opening of the petcocks and should not be considered as characteristic. You will note that the current values for each cylinder are almost the same.

The engine had been standing for some time before the test was made and the reduction in friction due to lubrication, after a few revolutions, is carefully indicated in the curve.

Car Tested Had Electric Gearshift

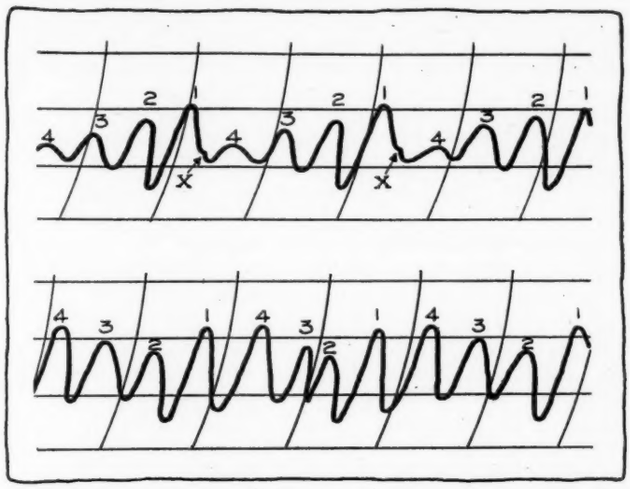
This car was also fitted with an electric gearshift of the non-automatic type, that is, the current supplied to the solenoids continued to flow until the clutch pedal was removed. This accounts for the fact that the area of the curves showing the current required for the shifting coils varies somewhat.

The current drawn by the solenoids on this car is about 35 amperes. Since making this test we have been advised by the chief engineer of the company manufacturing the car that the addition of an iron core in the solenoids has somewhat reduced the current consumption and that the breaking of the current is now accomplished automatically by the movement of the plunger as it nears the end of the stroke.

This record was taken at a chart speed of 12 inches per minute. During the operation of the shift, the chart moved 1-16 of an inch which shows that the time required for shifting with this mechanism including that of the operator in releasing the clutch was about 1-200 of a minute and consuming a current of 35 amperes, the energy required for a single shift was approximately 1-400 of an ampere hour.

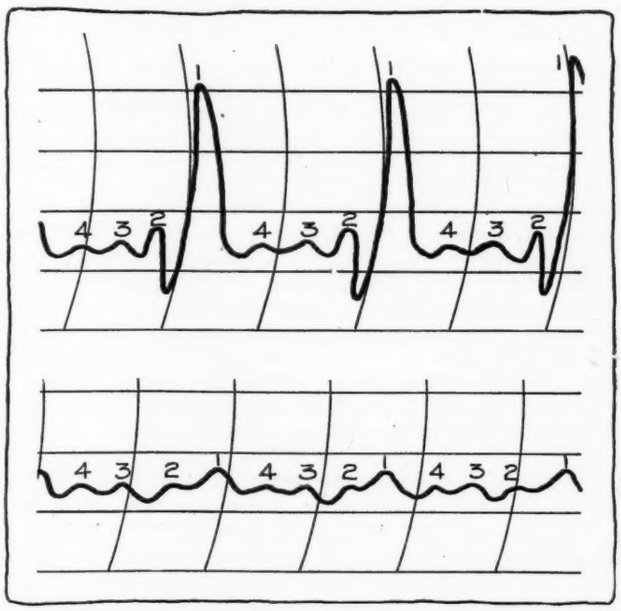
A curve taken from a six-cylinder engine of the same manufacture as number one showed a very smooth characteristic. The current variations throughout each cycle are so small as to be scarcely noticeable.

It is interesting also in this curve to note the variations in the initial current required to start the engine on different trials. These varied from a minimum of 70 amperes and on the second trial to a maximum of 130 amperes at the fifth start, doubtless due to the position of the piston when the gear was engaged and possibly some difficulty in engaging the gear.



A—Upper curve, showing current consumption of motor in starting a four-cylinder motor. Note difference in compression in the four cylinders. Valve out of adjustment indicated by X.

B—Lower curve, showing improved performance after valve was adjusted



C—Upper curve indicates current used when three of the spark plugs were removed

D—Lower curve shows frictional losses in cranking, all plugs being removed

The reduction in the current consumption to crank the engine after the few revolutions following the first start, is also noticeable. This is probably due to improved lubrication.

Another curve is from a six-cylinder motor driven by a separate starting motor through a flywheel pinion. This motor was manufactured by one of the companies using graphic meters for the testing of their motors, and this testing was made on a car recently delivered to one of their dealers.

Thus far all of the tests mentioned have been those made with separate circuit cranking motors geared to the flywheel and operated at relatively high speed.

Another test is of an engine equipped with a motor generator, lighting and starting unit, operating the engine at a speed of approximately 40 revolutions per minute. This is a 16-volt system and operating at a comparatively low speed it will be noted that the initial starting current is not greatly in excess of the current required to overcome the compression. This motor was tested immediately after coming in from a trial run and was still quite warm.

An examination of this curve shows that the current required for each compression was very different and strangely enough each succeeding value for the six cylinders was less. The minimum values of the current also vary uniformly.

We have probably said enough to indicate that the graphic meter can be equally well adapted to the test of electric vehicles and a number of manufacturers are using it for this purpose connecting the instrument in the motor circuit and making records of the motor operating under different conditions of temperature, grade, speed and battery conditions.

The equipment which we have here is a four-cylinder engine operated by a motor generator. No attempt has been made to adjust this motor in any way and we will endeavor to obtain some curves for you, after which we shall be pleased to have a full discussion of the points brought up as you may see fit to contribute.—J. W. ESTERLINE.

Interesting Demonstration Before Society

Esterline's paper closed with an actual test of a four-cylinder motor by means of the graphic recorder. The test was performed in the demonstration room before the engineers, the recording ammeter being used to plot a curve showing the variations of current required to turn the engine over by means of the starter. The recorder was intentionally thrown out of calibration so that the actual amount of current shown did not correspond with that really passing through the circuit, but the variation of the curve was that actually obtained.

The first test marked A shows the difference in compression of the four cylinders. In this the cylinder arbitrarily marked No. 1 had the greatest compression or at least required the most current to turn it over the compression point and the kick on the piston is indicated by the greater depth of the curve immediately succeeding this. It will be noticed that the arbitrary numbering of these curves is in the firing order and not in their actual position from front to rear. A slight bump at the point marked X between cylinders four and one indicates that there was some abnormality in the operation of the motor. It was taken to mean a valve was out of adjustment. The engineers immediately located the bad valve and after readjusting it curve B was taken. Here it will be seen that not only has the bump disappeared but the curve is more even all the way through there being less difference in compression, or rather less difference in the current required to turn the motor over the successive compressions. This instance pointed forcibly to one of the chief uses of the graphic recorder in motor testing, for the mal-adjustment of the valve indicated in the first curve was comparatively slight. Curve C was taken with the cylinder plugs removed from three cylinders so that compression was obtained on only cylinder No. 1. Curve D shows the frictional losses in the cranking motor, the cranking transmission and the engine itself, the curve being taken with the cylinder plugs removed from all cylinders. It will be noticed that cylinder No. 1 has the greatest loss, which may be due to a tight connecting rod, piston pin bearing or to a scored cylinder, lack of lubrication, or to a bad spot in the gearing.

Discussion of the paper and test centered chiefly about the results obtained by the test just described. W. G. Wahl, of the National Motor Vehicle Co., George W. Wiedley, of the Premier company, and Mr. Thomas, engineer of the Marmon company, expressed themselves as deeply interested in the use of the graphic meter and stated their belief in its practicability for the testing of the electrical devices of the car and as a final test before the car was delivered. It developed that one of the engine manufacturing companies, as well as several of the car makers, were employing the instrument to give them a permanent record of the engine's performance as well as that of the electric system at the time the car was delivered. These were retained and referred to in case of complaints from the owner of the vehicle.

Chicago's Show—America's Greatest

(*Continued from page 293.*)

a new absorber of this type is the Andersen, which has several leaves coming into play differentially in proportion to the depression of the main spring. All the recognized makes employing friction principles are doing big business.

Many New Non-Poppet Motors

The shows this year have brought to light an array of new motors. In addition to the Weidley poppet type there are a number of excellent non-poppet productions. The Charter is a newcomer which the Chicago show has brought to light. It has a single rotating sleeve actuated by worm gearing at the bottom. The Shaw motor with an overhead rotary valve, the intake and exhaust gases passing through the same ports alternately, is also seen for the first time at Chicago. With these two new motors and the Carter motor, also a piston valve type, which came out at the New York show, the non-poppet field is now well backed up. It takes in now, besides the Knight sleeve-valve type, the Mondex-Magic, the Model and the Meade. All of these, besides being very meritorious and efficient, operate on different constructional schemes and show great versatility in methods of arriving at the taking in of the charge and the removal of burnt ones.

Automatic gearshifts are well represented in the national Chicago exhibition. Here the Gray pneumatic system appears as a part of the McFarlan car. This is the first time that this air shifting apparatus has appeared on a stock machine and much interest centers around the operation of it. There is also in the field the Vulcan electric gearshift as fitted to the Norwalk, S. G. V., Pullman and Haynes cars, besides the several mechanical automatic shifts, the latest of which is that brought out by the Bungay Mfg. Co., Brooklyn, N. Y. With this system the driver sets a small finger lever much like the throttle lever and when the clutch pedal is operated the shifting is done just as with the other automatic types.

Devices Designed for Economy

In the accessory field there is a marked tendency to bring out devices which will aid in the economical running of the machine. The main idea is to get at means of reduction of operative cost and to this end fuel economizers which cost little but which are intended to effect a considerable saving of fuel are numerous. Then, too, most of the devices have been designed so that they may be sold to the average car owner who cannot afford any great outlay in the way of accessories other than those with which the car is fitted when it leaves the factory. In other words, along with the reduction in car prices and the greater number of machines around the $1,000 figure the whole accessory field has sought to reduce its prices without in any way affecting the efficiency of the articles which it markets. It is getting its devices down within the means of the man who buys the medium and low priced car, for he is the dominant class and the one which the accessory maker must interest.

Chicago Has First Cyclecar Show

Both Cyclecars and Light Cars Exhibited—Variety of Seating Arrangements—Closed Bodies Shown for the First Time

THE Chicago Show marks the first gathering of cyclecar interests in America in an attempt at a separate cyclecar show. Though few are really represented yet those exhibiting are proving the interest of the public in the new motoring and are adding greatly to the establishment of the firm names. Firms not showing state that they have already sold beyond their year's output and hence do not feel the necessity for exhibiting at this time.

Three cyclecars are to be seen in the cyclecar division, the Mercury, the Coey and the Imp, while in the light car class the LaVigne, the Trumbull and the Car-Nation are shown. Each exhibit is attracting enormous attention, the crowds around the exhibits enabling the visitor to pick out the cyclecar booths from a distance.

The largest exhibit is that of the Imp Cyclecar Co., this firm displaying four cars of standard construction, but of different colorings, these showing the mechanism, the body type and the effect with top and windshield up. This firm is turning out about thirty cars a week at the present time and will double this figure within 30 days, according to plans given out by that company this week.

Mercury Offers Tandem and Monocar

The Mercury cyclecar exhibit shows two types of cars, the regular tandem type and a monocar—this last a type that will have a tremendous appeal for real work, as well as for all solo riding. The monocar is a cyclecar for but one person and luggage, and is intended for the salesman, the collector, the business man who goes from place to place about the city in his daily work and whose firm does not wish to pay for joy riding outside of business hours. The motorcyclist will probably graduate to the monocar also and for a little more money thus get a clean all-the-year-round mount of greater comfort and reliability and no more upkeep. The Mercury is the first monocar made in America.

The Mercury cyclecar is a tandem, friction-belt drive car fitted with a Spacke motor and Atwater-Kent ignition system. The motor is placed up front and an enclosed shaft drives from a strap joint at the motor to a friction disk of cast iron under the front seat. The jackshaft carries the paper-faced friction wheel and at each end of the shaft is a V-pulley from which belts convey the power to the rear wheels. A lever at the right of the front seat shifts the friction wheel for change of speeds, while a pedal takes care of the thrust of the disk against wheel for clutch action.

The car is very simple in mechanism and pleasing in lines.

The body has high sides, but side doors are fitted to enable the riders to get in and out easily. One of the features of the car is the lifting door fitted at the rear. The bottom of the door is held from side action when entirely in place by a dowel arrangement, or groove. By lifting the door slightly to get the catches out of the grooves the door can be taken off completely and replaced after entering or leaving.

The steering wheel is connected through a rack and pinion gear, direct to the steering arms, and the spark and throttle controls are on the steering column as in large car practice. The dash is set back under the hood edge several inches and contains the spark coil and switch. The speedometer is carried outside of the car on the right. The lever for shifting the friction wheel is shown at the right. The car is using body fenders instead of the motorcycle type.

Coey Exhibits Coupé Model

The Coey Junior cyclecar is exhibited in the basement of the Coliseum, and is a side-by-side seating, 42-inch tread machine fitted with a twin Mack motor and friction-belt drive. The wheelbase is 96 inches.

The frame of the car is of pressed steel and the springing elliptic in the rear and half-elliptic in front, the springs being 36 inches long and of ample action.

The lines follow car practice throughout.

A coupé model is also offered, but this is fitted with a four-cylinder water-cooled motor and hence comes into the light car class. This enclosed type has all the looks of more expensive cars and should put up equal performance.

The Coey and the Mercury are the only new cyclecars shown at Chicago within the show itself, but outside there are several more at the different agencies.

The Woods Mobilette Co. has completed its first car and has this on exhibit at the showrooms on Michigan avenue. This car is a 30-inch tread, tandem seating machine with shaft and planetary drive and a full line of body designs. It is fitted with a four-cylinder Henderson motorcycle motor, and has the features of the original Woods model as to seating and frame arrangement, etc. The springing is changed to fit the new conditions and altogether the car is a great advance over the machine built by Mr. Woods as the basis of the present company.

The Flagler cyclecar is also on view on Michigan avenue, the first car built being shown as what the firm will market on the completion of the organization plans now under way. This machine is a side-by-side cyclecar with friction-belt drive and fitted with a two-cycle, two-cylinder motor of the Frederickson type.

Steco Shows Handsome Model

Seen, from time to time, about the show are two other cyclecars being built in or near Chicago, the Steco, built by the Steco Cyclecar Co., Chicago, and one of the prettiest cyclecars yet built, and the Dayton, of Joliet. Both of these are tandem, 36-inch tread cars, friction-belt driven and both capable of astonishing speeds with comfort.

The Steco car is very complete and represents the most expensive type of tandem cyclecar made so far, while the Dayton is one of the simplest, lightest cars on the road, and perhaps the fastest.

The first named machine has a Mack, V-type motor of special construction and exceptional quietness, a friction transmission just back of the motor and long belts from the jackshaft to the rear. Running boards are fitted on either side of the car connecting the fenders, which are exceptionally large and protective, while the mahogany instrument board and side rails give the appearance of class of a $5,000 car. The machine rides with exceptional comfort, having long cantilever springs at the rear and cross-springs of the Parnacott type at the front.

A mechanical starter which is operated by a convenient lever is used.

The running boards fit over the front belt pulleys so that the belt runs on both sides of the boards. At the rear the belt runs

out of the fender through a tube, thus protecting the body from dirt which the belt might carry through from the road.

The running boards and floor of the car are covered with cork linoleum, while the body is finished in gray and red. The car runs quieter than most of the cyclecars so far built, and is in feeling and performance a real car of real workmanship and engineering. It is to sell for $450.

Dayton Has Simple Chassis

The Dayton cyclecar while of simpler construction in most respects and having less parts and perhaps refinements of trim and finish yet for performance has not been beaten by any car to date. It is of the very simplest type, is fitted with a Spacke motor and has tandem seating. Other models with side-by-side seating and a water-cooled motor are to be produced.

Next to the Mercury exhibit at the show is that of the La Vigne light car. This machine is a side-by-side, 50-inch tread car fitted with a small four-cylinder air-cooled motor. It has a pressed steel frame, a three-speed and reverse gearset in unit with the motor and worm drive. The design follows car practice throughout. A very low, but wide body is fitted and everything about the car arranged for comfort. The springs are elliptic and are mounted on an underslung frame.

The car has left steering with center control. The dash contains the switch for the Mea magneto, the sight feed oiler, the lamp switches, and the battery ampere meter. Next to the brake pedal is an engine cutout pedal.

The Trumbull light car is shown in the basement of the Coliseum, together with a four-cylinder water-cooled motor of the type used in the car. This machine has been completely described in these columns and needs no further outlining. It is a well set up side-by-side light car of motor car specifications, but on a small scale, fitted with a friction transmission and a final chain drive.

Car-Nation—A Real Automobile

The Car-Nation light car is a real motor car in every respect, but with a narrower tread. It is made with several sizes of body for from one to four persons and makes no claims to the cyclecar class, though born during the cyclecar development period. Great interest was shown in this car by the public in general.

The Saxon light car is on display at the agency on Michigan avenue. This too is a small motor car in every particular and hence not included in the recent movement, though proceeding from it. This car and the other light cars will find a large market in their own field and there will probably be no interference back and forth between the light car and cyclecar classes—each having particular advantages. The greatest enthusiasm at present is for the simplest, cheapest vehicles, but whether this will continue depends on the workmanship and construction of the new vehicles. Given the right construction there is a real future for the real cyclecar. There is a big field uncovered which demands this type of machine.

Many Outside Exhibits at Salesrooms

CHICAGO, ILL., Jan. 26—Chicago's fourteenth annual motor car show is not confined to the Coliseum, Coliseum Annex and First Regiment Armory. Michigan avenue, the motor row of the city, is thronged daily with connoisseurs, many of whom have been attracted to the Rue de Gasoline by the knowledge that several dealers, unable to secure space at Sam Miles' centralized attraction, are exhibiting cars in specially decorated salesrooms.

The Ford Motor Co., according to its usual custom, is having a show all of its own at the new local branch and assembly plant, Wabash avenue and Thirty-ninth street, which was formally opened to the public this morning. Three models are being shown: the town car; the touring car and the runabout, and visitors are being taken through the assembly plant, six guides being employed for this purpose.

The Chevrolet Motor Co., which took possession of the salesrooms at 1444 Michigan avenue formerly occupied by the Ford, also is having an auspicious opening and has on display a big six and small fours in touring car and roadster types. The Chevrolet maker was among the many unfortunates that could not get space at the main show.

Ralph Temple, one of the local pioneers along the row, has been forced to hold a private exhibition in order to display the 1914 Empire models. He has on exhibition at his salesrooms a touring car, roadster and stripped chassis.

J. L. Russell, local distributor for the Pullman, is displaying a small four and a little and big six at his agency.

Norwalk Exhibited with Electric Gearshift

The Norwalk, one of several makes of cars that is equipped with the electric gearshift this season, is on exhibition at the local salesrooms because of lack of space in the Coliseum. A six-passenger and four-passenger touring car, each equipped with the automatic gear-shifting device, are on display as well as a special roadster, painted white and striped with gold.

The Simplex is not represented at the Coliseum but the local agent, the Tennant Motor Ltd., has at the salesrooms a 1914 model limousine equipped with a Holbrook body of distinctive lines.

Two of the small débutantes of the season, the Grant and the Saxon, could not crowd their way into the jammed Coliseum and are being exhibited by the local agents at the salesrooms. The Saxon representative has one demonstrator that is working overtime and breaking all union rules in carrying prospects up and down Michigan avenue.

Although exhibiting at the Coliseum, the Cartercar and Pierce-Arrow have an added attraction at their respective salesrooms where the first cars of each make attract a large crowd to the windows. The Cartercar is of a vintage of 1901 and the antique Pierce-Arrow is a year younger. Neither looks very formidable alongside the 1914 creations.

Among the accessory makers having displays at salesrooms, the Firestone Tire & Rubber Co. has a most attractive window display. A motor car and a cyclecar, made of tires and tube boxes, are shown against a winter background.

Columbus Buggy Co. Has New Model

The Columbus Buggy Co., Cleveland, O., makes use of the Chicago show to bring before the public its new Colonial electric brougham, model 1235. The car seen at the Chicago exhibition is painted a pure white, striped with gold leaf and trimmed in an old rose silk poplin. The standard design is of the conventional dark color, body is of sheet aluminum, with no exposed wood surface, the pillars and other wood parts being covered with aluminum, and this together with the entire door construction of the same metal makes a very strong and light construction throughout. The car has a high-speed motor driving through a single reduction by means of worm gearing. It carries a forty-cell battery of the seventeen lead plate no-wash type. Steering is by means of side lever while the control is also by horizontal lever above the steering handle. Braking system incorporates two independent sets on each rear hub, the drums are 14 inches in diameter and the brake shoes expand internally, operating by pedal. The emergency brake is located on the motor armature shaft and is operated by a backward movement of the control lever. Six forward speeds and reverse are provided, giving from 5 to 21 miles per hour.

Charter Motor Makes Its Debut

(*Continued from page 299.*)

maximum opening for 28 degrees and is 82 degrees in closing, giving a total range of 192 degrees. Looking at the exhaust valve, its range of opening covers 228 degrees, of which 110 is obtaining maximum, 8 degrees at maximum, and 110 closing.

The intake port starts opening 14 degrees after top dead center and closes 26 degrees past bottom dead center. The exhaust valve begins opening 43 degrees before bottom dead center and closes at 5 degrees past top dead center.

With this timing on a six-cylinder block motor with cylinder 3 1-8 by 5 1-2 and operating at 2,400 revolutions per minute, Mr. Charter has obtained 55 horsepower on block test.

Externally the Charter motor, Figs. 1 and 2, showing right and left sides, is a clean cut block construction with the intake and exhaust manifolds detachable units and carried on the right side. The left side is clean except for water pump and magnets. In its present design the motor uses a conventional crankcase construction with four bearings supporting the crankshaft. The flywheel is entirely inclosed and a three-speed selective gearset is made a unit with the crankcase. On this gearset is the Jesco electric starter interposed between the clutch and the engine.

The lubrication of the Charter motor is by a force feed system with pressure supplied by a gear pump located in the crankcase.

Shaw Motor Has Rotary Valves

New Motor Uses the Same Set of Ports for Both Intake and Exhaust Gases—Ports Open Into Cylinder Heads

A ROTARY valve motor in which the explosive mixture is allowed to enter the combustion space through the same port as that through which the exhaust gases escape has been brought out by the Shaw Motor Co., Chicago, Ill. The rotary valve or plug is driven from the front end of the engine by silent chain which is completely inclosed in an aluminum housing. The plug is disposed directly above the cylinders and allows the ports to open directly into the cylinder heads which makes for complete scavenging of the burned gases. The rotary plug has a slight taper so that as the plug or case wears the former can be set a little further into the case to take up this wear. Lubrication of this revolving member and its bearing surface is taken care of by mixing the oil with the fuel as in other rotary valve types. The valve case is waterjacketed entirely around the plug, not only with the aim of keeping the plug cool but with the idea of protecting it from the heat of explosion.

Is Capable of 5,000 R.P.M.

Due to the positive opening and closing of the ports comparatively high speed can be obtained with this motor, the inventor stating that the maximum is 5,000 revolutions per minute, at which with eight cylinders, 3 inches bore and 4 inches stroke a maximum horsepower of about 60 is obtained. At 2,000 revolutions per minute the development is 35 to 40. The design exhibited at Chicago is of this eight-cylinder form and due to the absence of valve ports and the compact design of the waterjackets a remarkably short power plant results, it being stated that this eight-cylinder engine, together with the flywheel, has a less overall length than the average six-cylinder engine of ordinary design. Although the Shaw motor is of the high-speed type it may be throttled down to ordinary engine speeds to meet many road conditions, it is said.

Mounting of Pedal Shafts and Levers

Many Examples of Both Good and Bad Construction in This Respect at Chicago Show

Some Engineers Have Ignored Weaving of the Frame which Exerts Stress on Other Members

JUST how the designers of the different cars mount the brake and clutch pedal shaft and the control levers is an interesting study, particularly when the investigator is afforded an opportunity of viewing a number of representative chassis as displayed at such a gathering as the Chicago show, and of comparing them point by point in this particular.

There are many examples of good and bad construction in this mounting feature, as in every other part of the chassis. It is an easy matter to attach a cross shaft to the side-frame rails through the use of bearing brackets on either side and to mount the clutch pedal and brake pedal on it so that each will properly perform its function, but the trouble begins here.

Every car frame is subjected to a certain amount of variation in the relative positions of the side members due to road inequalities and other causes and this frame movement, however slight, must be allowed for in the design of the shafting and bracketing which runs crosswise between the main members. The frame cross members are intended as a means of bracing the main rails so that this variation is reduced to the minimum. Unless this cross-bracing is very rigid and unless there are a number of such cross-pieces any cross-shafting such as that for carrying clutch and brake pedals is subjected to this slight change in the relative position of the main frame members and binding, however slight, results. In most instances, this would not assume very great proportions but there are extreme conditions to which the chassis is sometimes subjected which would make such binding serious and might go so far as to prevent the proper working of brake and clutch.

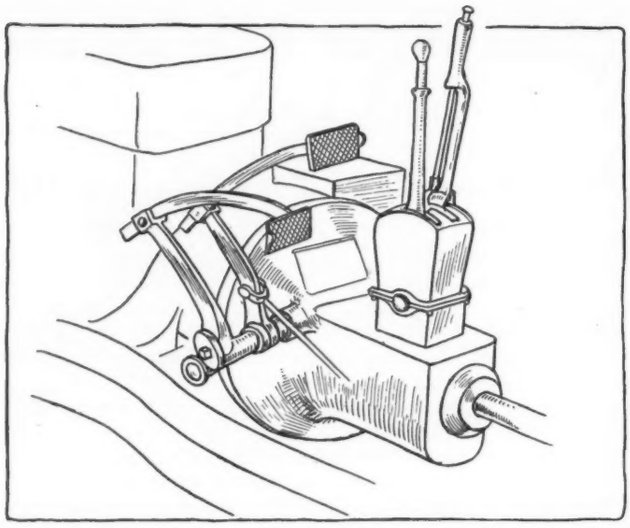
Most engineers have realized this point fully and where cross shafts are used to carry pedals a cross-member parallels this shaft in close proximity to it so that the weaving of the frame rails at this point is almost nil. But there are cases where the engineer has apparently lost sight of this important fact in chassis design.

Unit power plant construction wherein the clutch and gearbox are housed integrally with the crankcase undoubtedly lends itself best to the theoretically correct mounting of the brake and clutch operating mechanisms. The shaft carrying pedals may easily be bracketed to the side of the gearcase and thus is entirely free of the frame and gets away from any of these binding possibilities due to inequalities in the frame rail position. Most unit power plants are three-point suspended and any frame movement is taken care of by the flexible support, and the pedal mechanism being a part of the unit moves with the motor independently of the frame.

There are many good examples of such bracketing of the pedal shafts to the side of the gearcase, among these being the King, Hudson, Krit, Paige-Detroit, Buick, Oakland, Lozier, Briscoe, Imperial, Kisselkar, Premier, Packard, Cole, Chalmers.

Pedals Should Be Mounted Close

In running a shaft out from the side of the gearbox, the engineer has the distance between the gearbox side and the side member of the frame in which to locate his pedals. But it is desirable to place them as close as possible to the point of support on the gearbox in order to strengthen the shaft against the canti-



Method of mounting the clutch and brake pedal shaft and the control levers on the Cole. This gets away from any of the binding possibilities due to any inequalities in the frame rail position. Any frame movement is taken care of by the flexible mounting of the power plant and the pedal mechanism, being a part of the unit, moves with the motor independently of the frame

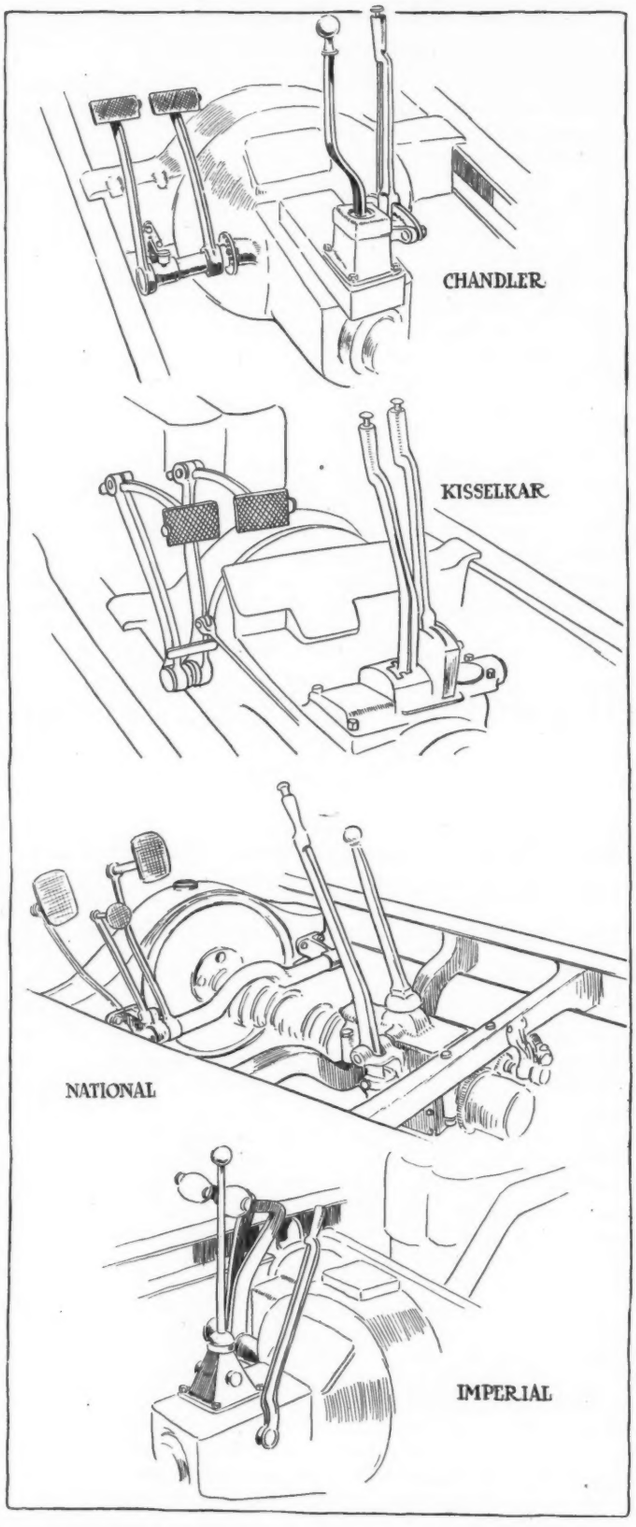
lever effect which of course increases with the length of the arm. In most cases therefore the ends of both pedal arms are mounted close together for space economy with reference to the shaft length, and the clutch pedal, which, with most left drive cars is the outer of the two, is bent outward from its point of support so as to give the proper clearance between the two pedals for non-interference of the feet in driving. This has the slight disadvantage that the point of pressure of the foot is not in line with the pressure on the shaft but such is so slight in comparison with increasing the length of the operating shaft so as to make both pedals straight that it is hardly worth mentioning. It makes for a short shaft and at the same time has practically all the advantages of the long shaft running all the way to the side of the frame so far as bracing goes. This mounting close together of the lower ends of the pedals both makes the short shaft very desirable and gives a compact assembly. Good examples of this practice are found in the new Buicks, Lozier, Premier, and many others.

Of course the bracketing of the pedal shafts to the side of the gearbox is not essential although it is well nigh standard practice. It is often seen attached to the flywheel housing just ahead of the gearbox in unit power plant construction but the result is the same.

But the brake and clutch pedal arms are not always mounted close together. The Chandler is a good example of the use of a longer shaft and straight arms which are some distance apart, a bracket attached to the left integral arm of the motor crankcase supporting the shaft between the two pedal arm mounting and serving to make the shaft very rigid. This is good design in that the bracket is incorporated with the motor unit and allows for shaft variation independent of the frame at the same time giving a very rigid support to this shaft.

Adjustment for Operating Range of Pedals

There are types of unit power plants in which the flywheel and clutch are not inclosed, a yoke of substantial design passing around these two essentials and carrying the gearbox. This makes possible the very neat mounting of the pedal shafts to one of the arms of the yoke. The Paige pedal assembly is a good example of this. The pedal shaft runs under the yoke arm from which it is hung by substantial brackets. Between the yoke arm and the gearbox, the clutch pedal arm passes down to this shaft while the brake arm is on the other side of the yoke arm between it and the frame. Thus the support from the yoke arm is be-

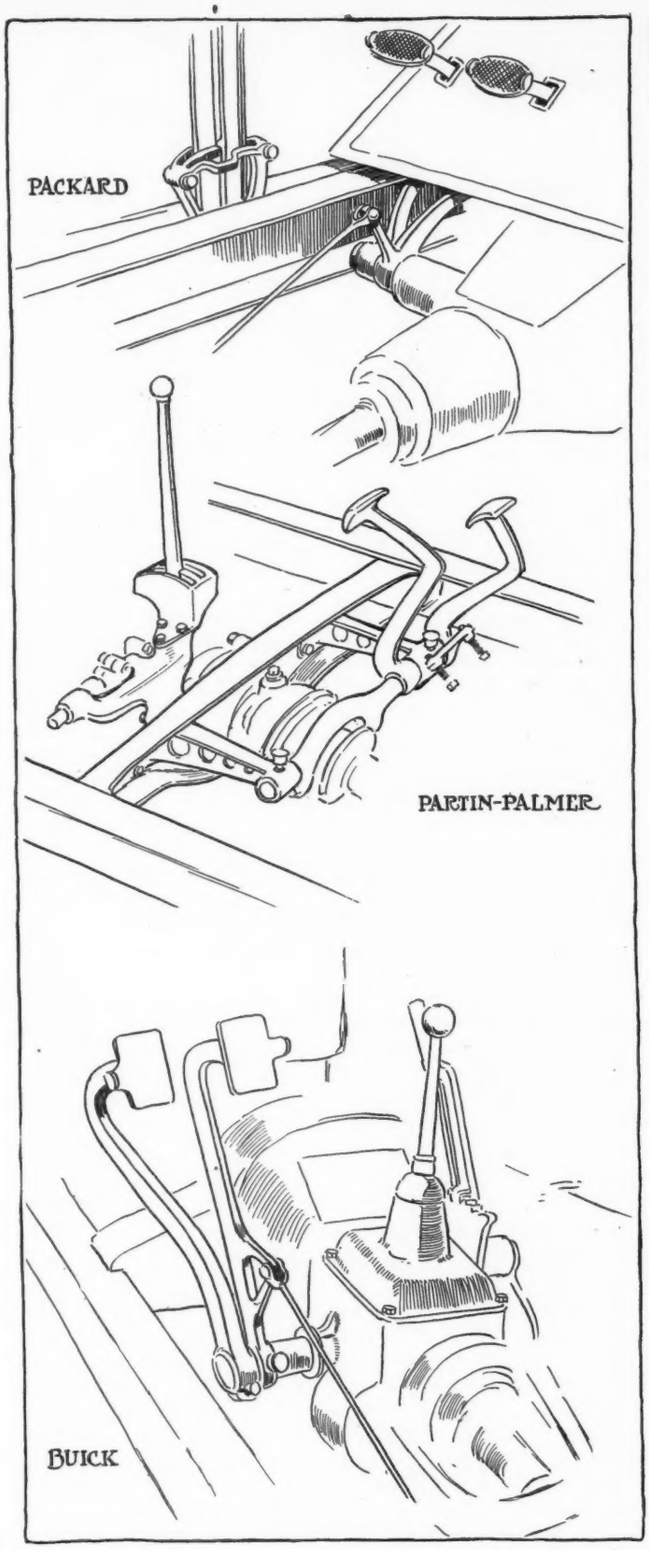


The Chandler attaches its pedal shaft to the gearbox housing and by bracket to the left motor arm supporting the shaft between the two pedal mountings. This provides for shaft variation independent of the frame and gives a very rigid construction

The KisselKar, like the Cole, mounts its pedal shaft at the side of the gearcase, thus insuring freedom of stresses occasioned by a twisting frame

On the National a cross member is used to support the pedals, but this is not attached to the frame member directly, being bracketed to the supporting arms of the motor

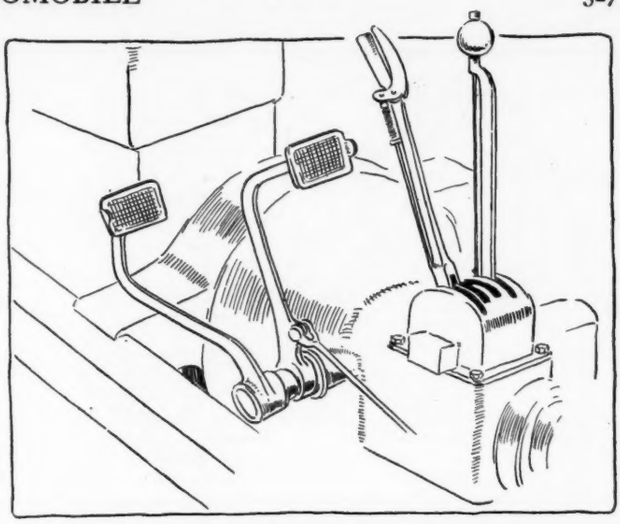
The Imperial employs the same design as the Cole and the KisselKar, mounting the pedal shaft at the side of the gearbox



The Packard supports its pedals on a shaft extending from the flywheel housing. This is theoretically correct engineering practice. The levers are mounted on the left outside the frame

The Partin-Palmer has a novel method of mounting its clutch and brake pedal shaft, bracketing it to the main cross member of the frame, one bracket being located at each side of the universal joint on the drive shaft which is also supported by the cross member. The pedals are mounted at the left

On the Buick the pedals are mounted on a short shaft at the left side of the gearbox, this construction being the most popular for 1914. The control gearshift lever is mounted directly on top of the gearbox, the emergency brake lever being mounted at the side



The Chalmers follows the design which is apparently becoming standard practice, mounting the brake and clutch pedal shaft at the side of the gearbox. As left drive and center control are rapidly becoming standard, practically all the cars using this type of mounting have the pedals at the left. The levers are mounted in the center directly on top of the gearbox, a location which is also apparently becoming standard construction

tween the two pedal arms and gives a very rigid mounting, besides constituting a well-balanced construction.

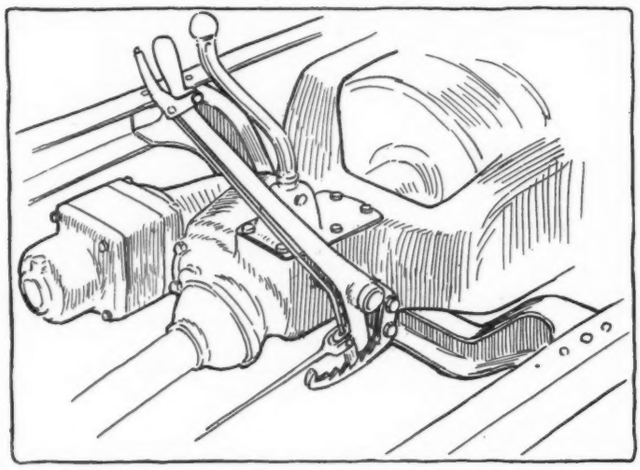
Adjustment of some kind is usually provided so as to govern the operating range of the pedals, and this takes several forms. On the new Lozier four a flange attaches to the operating shaft and another to the mating portion while a series of holes is drilled in each of these two flanges, which may be bolted together in any combination so as to give the desired position to the pedals. Others make use of strapped ends to the pedal arms, which in most cases are keyed to the shafts, several such keyed positions being possible.

Since the clutch pedal and its mechanism must be in close proximity to the flywheel, which usually incorporates the clutch, those constructions which do not take the unit power plant form, of necessity have to have some form of cross-shaft running just back of the flywheel and ahead of the gearbox. The attachment of the shaft to the main frame members is the easiest way to take care of the clutch and brake-pedal mounting. But unless there are the several cross-members, which add weight, the difficulties pointed out above immediately enter in. However, there are ways of getting around this difficulty and of making the shafts a part of the motor assembly. National has done this very neatly in its new six by bracketing the clutch operating shaft, on which the brake pedal is also mounted to the rear of either arm of the rear motor support. In this way the shaft does not receive any of the variations of the frame members, and the same result is accomplished as by attaching the shaft to the gearbox, although in this case a unit power plant is not used and the gearbox is back of the shaft.

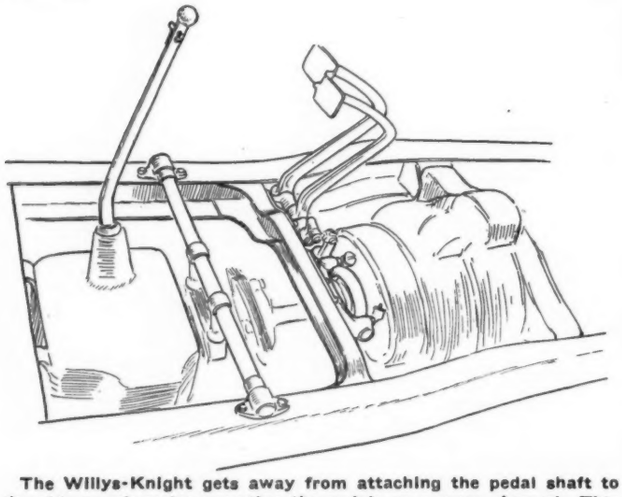
Packard Mounts Pedals on Clutchcase

Although the Packard cars have not the unit power plant, the gearbox being at the rear axle, the pedal shaft is mounted on the flywheel housing, just as it would be in the unit power plant and independent of the frame.

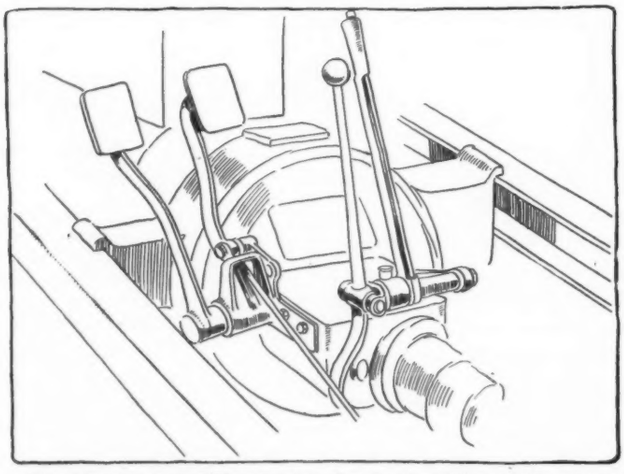
Other designers who have not adopted the unit power plant have bracketed this pedal shaft to a cross member which runs just back of the motor and which gives almost the same effect as having the shaft a part of the power plant. Although it cannot be denied that the shaft is now made a part of the frame, and not of the motor assembly. The heavy cross brace really precludes any possibility of any great frame variation at this point, but from the nicety of design standpoint it is not as good practice. Added cross-members of this kind increase weight.



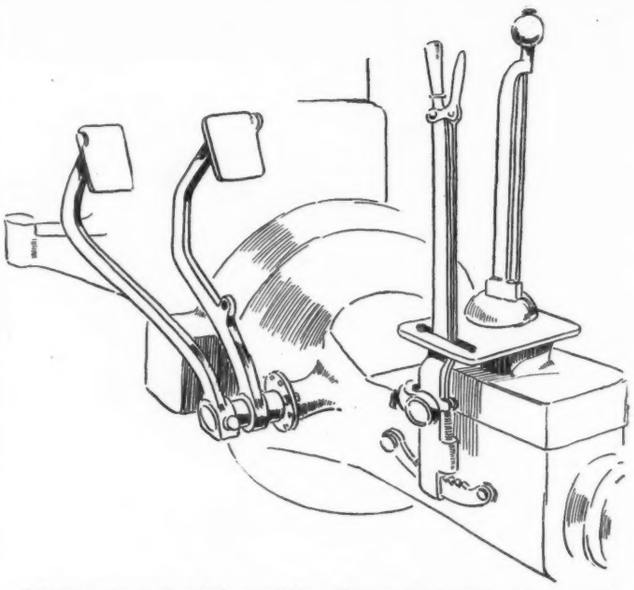
The change gear and brake lever construction on the Briscoe car is exceptionally simple. The speed lever oscillates on a ball joint that is located in the gearbox cover, the lower end of the lever engaging directly with the jaws on the shifting rods. The brake lever is attached to the power plant housing, giving a direct pull to the rear



The Willys-Knight gets away from attaching the pedal shaft to the side members by mounting the pedals on a cross-channel. This car is another good example of simplified gear lever mounting, with the lever supported by the gearbox cover



The Premier exemplifies good design in the fitting of the control members in connection with a unit power plant. The pedals are carried on a short shaft that is bracketed to the side of the gearcase. The hand levers are located at the rear of the transmission, thus simplifying the connections and at the same time allowing of easy access to the gears



Lozier lever and pedal assembly. The control levers are mounted on the top of the gearbox and the pedals are attached to a short shaft extending from the clutch housing. Adjustment of the operating range of the pedals is provided by the flanged coupling illustrated

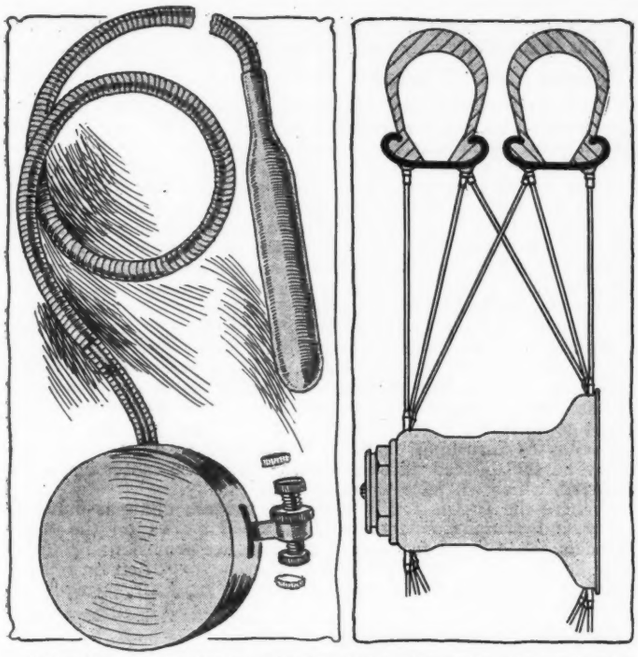
and this alone is an argument in favor of the more compact incorporation of the pedal shafts as a part of the power plant, which construction is the most popular if the present national show can be taken as any criterion, and it undoubtedly can.

Control lever mounting has also come in for a great deal of consideration by the careful designer of today. The majority of the chassis appear with shifting lever and the emergency brake lever mounted directly on the gearbox, whether it be a unit power plant design or a separate gear change assembly. Cross shafts running to the frame members for controlling emergency brake and the gears admit of the same objections as far as binding goes, as does the use of such shafts for the operation of the control pedals, and at the same time mounting on the gearbox is much more compact. This elimination of control lever shafts was not possible when right control or left control was looked upon as standard, but nowadays when average American practice dictates the use of center control, such mounting is used not only for its better engineering features, but also from the fact that it is the logical and only mounting.

Control Levers Well Mounted

Advantage is very often taken of this location of the control levers to incorporate their mechanism in the cover of the gearbox so that when the latter must be removed to get at the gears the lever assembly, whether it be of the H-gate type or of the ball and socket shifting design, comes off with it. There are many cases, however, which do not incorporate both emergency brake lever and control lever in the same unit, the latter alone being assembled as a part of the gearcase cover and the emergency lever being attached separately to the gearcase. Very often this finds its position on the side of the case if the pedal shaft will give it room, or on the other side, providing the former shaft takes up all of the available space on the side opposite.

The new control of the White cars is an example of the complete isolation of the change gear lever and the emergency brake lever, the latter being over near the left side of the frame, while the control lever is in the center, the driver sitting with one lever on either side of him. This should have the particular advantage, aside from any engineering consideration, of preventing any confusion between the two levers in times of emergency when quick operation is necessary. It would not be possible to grab the change gear lever thinking it the emergency brake lever.

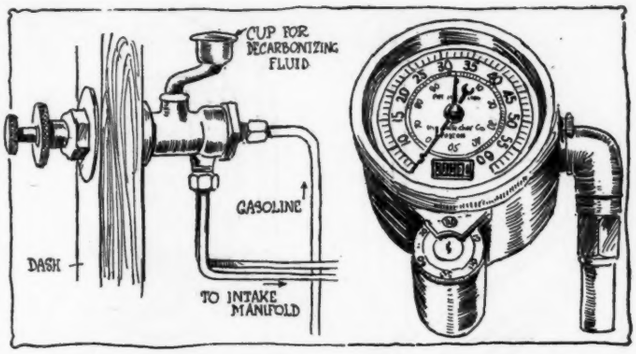


Left—The new Stewart Thermo-automatic carbureter adjuster designed for attachment to the air intake lever of the carbureter in such a way that the quantity of air admitted depends on the temperature of the engine. At the right is a cross section of the latest Dunlop wire wheel in which two rims are carried on the standard hub. This dual wheel is intended for heavy car service

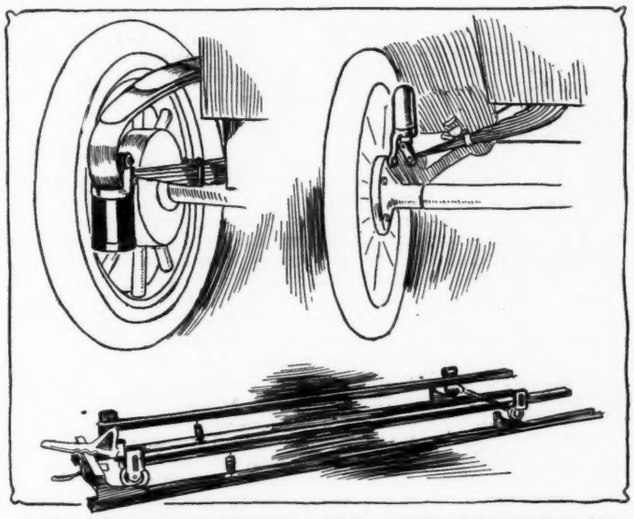
New Accessories at Chicago

Dual Wheel and Automatic Carbureter Adjuster Among Latest Devices for the Comfort and Convenience of Drivers

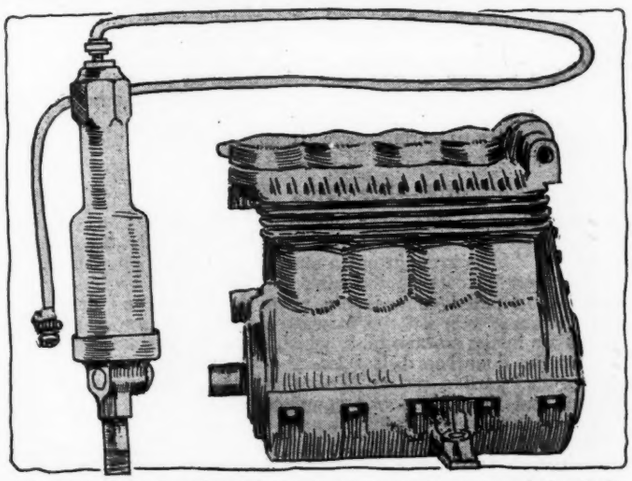
SEEN for the first time in America is a dual wire wheel, that is one carrying twin tires and intended for heavy touring car service and limousine use. The Dunlop Wire Wheel Corporation of New York is showing this wheel. The cross-section illustrated shows the arrangement of spokes from one hub to two rims, these rims being approximately 1 1-8 inches apart and held together by eight riveted bridges connecting their adjacent edges and regularly distributed around their circumference. This dual wheel uses the Dunlop standard hub, but has 96 spokes as compared with 70 on the single wheel. These spokes are arranged in two series, one connecting with the outer end of the hub and the other with the inner end. Each of these series is subdivided into three parts as illustrated, namely: an outer row of spokes approximately straight and attaching to the outer side of the outer rim; another row attaching to the inner side of the outer rim, and lastly a row attaching to the outer side of the inner rim; thus from the outer end of the hub there are two rows of spokes attached to the outer rim and one to the inner rim. In the three divisions of spokes from the inner end of the hub this arrangement is reversed, in that two rows of spokes are attached to the inner rim and one to the outer. This spoke arrangement braces both rims radially and diagonally, giving a rigidity the same as in the single rim wheel. The two outer circles of spokes, at the outer end of the hub, are tangent spokes and the inner ring of spokes is radial. At the inner end of the hub this arrangement is reversed in that the two inside rows, that is, the rows nearest the car body are tangent and the re-



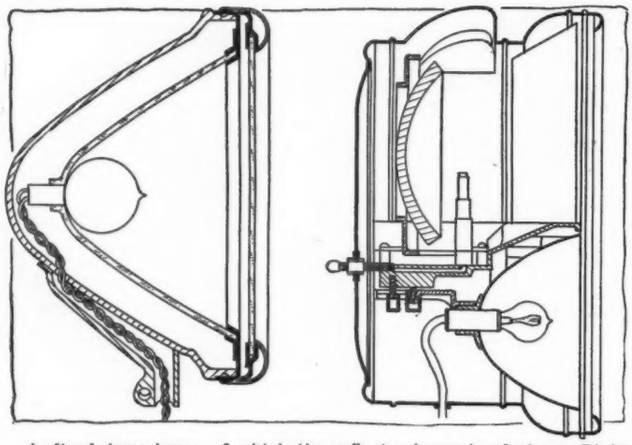
Left—Kellogg primer. The smaller knurled nut controls the flow of gasoline. The larger is turned to admit air or decarbonizing fluid through the cup behind the dash. Right—The new Hoffecker-Evans Speedometer-Speedlock, which includes, besides speed-governing mechanism, an ignition lock. The figures on the lock can be set at any maximum speed over which it is then impossible to drive the car owing to the ignition current being automatically cut off by the instrument



Left—Johnson shock absorber, which consists of two springs concentrically arranged in a cylindrical casing. A bolt passing through from the lighter spring provides for adjustment at the base. Right—Halliday shock absorber, which is specially suitable for application to Ford cars. Below—The Giant automatic auto jack, which raises the car entirely off the floor by the action of the upper frame sliding up small inclined blocks on the lower fixed frame



Left—Marvel impulse tire pump for operation in sparkplug hole. Right—The compressor of the Gemmer air starting system. The valves are arranged so that when not acting in the capacity of a pump, and when air is supplied from the air tank the same unit becomes an air motor for starting purposes



Left—Arbeco lamp, of which the reflector is made of glass. Right—Sectional view of P-G-N combination gas and electric lamp. Both lamps are contained in a single casing and either or both systems may be used at a time

maining one radial. The wheel illustrated is intended for 32 by 4 1-2 inch dual pneumatics. The Dunlop company has opened a factory in Long Island City, N. Y., where it is already making wire wheels for use on American cars.

Stewart Thermo-Automatic Carbureter Adjuster

One of the new things at the show is the Stewart thermo-automatic carbureter adjuster, manufactured by the Stewart-Warner Mfg. Co., Chicago.

Its purpose is to overcome the objection to the present systems of carburetion, that of the need of a varying mixture for different temperatures. It is common practice to fit hand-operated devices by which the quality of the mixture, that is, the proportion of gasoline and air, may be varied in recognition of the fact that a good starting mixture when the motor is cold is much too rich for efficient running after the engine warms up. The Stewart carbureter adjuster makes these variations in the mixture automatically and changes the carbureter adjustment for each change in temperature of the motor.

The instrument consists of a thermometer tube and a flexible conduit which ends in a small disk-shaped housing containing a lever operated by the movement and pressure of the fluid in the flexible thermometer tube. The housing or disk is attached to the carbureter so that movement of the lever operates the air intake, closing it when it is cold and opening it gradually as it becomes warm. The other end of the flexible thermometer tube corresponds with the mercury bulb of the thermometer and is inserted in the water manifold of the engine, so that the adjustment of the carbureter is directly dependent upon the temperature of the water circulating around the cylinders. It may be hung just behind the radiator if it is not desired to tap the waterheader but the direct method is probably more accurate.

The instrument is composed of a metal bulb, connection tubing, and a Bardon coil incased in a metal box from which protrudes a plunger or pushrod, and is attached to the carbureter in such a position as will allow the pushrod to operate on the air valve in some motors and the needle valve in others. The pushrod has a 5/16 inch movement which can be adjusted for different styles of carbureters. It may be applied to any make of carbureter and is listed at $20.

Kellogg Air Starter—For Fords

Responding to the ever-increasing demand for a satisfactory starter for the Ford car, the Kellogg Mfg. Co., Rochester, N. Y., has brought out a starter, with simplicity, efficiency, and moderate costs as the aim. A four-cylinder Kellogg air pump is mounted conveniently upon the motor and driven by chain from a gear on the forward end of the crankshaft, this stores air in the storage tank, which upon the pressure of a button on the floor board, is released to a starting cylinder which drives backward a piston in that cylinder. Connected to this piston, and then given one complete turn about a drum, contained in a housing, mounted upon the front of the car is an electrically welded chain. The fan belt pulley is replaced with a combination pulley and sprocket for driving the pump, and a clutch which engages automatically with the motor when the starter is operated. The motor is turned so fast that one impulse turns it over several times. A spring returns the drum and prepares the starter for a second application of power. The air supply in the tank can be replenished by the pressure of a pump control button which throws the pump into operation. The outfit is supplied ready for attachment on the Ford at $70.

Kellogg Primer Used with Starter

The Kellogg company has brought out a gasoline primer to be used in connection with this starter, or with any other, or even with hand started engines, to insure starting in cold weather. It is designed in two models, one a visible self-filling model for cars having gravity feed, and the other for pressure systems. In both the arrangements a lead is connected to the gasoline feed line, and two small pipes are run, one through each arm of the intake manifold and thence directly under the intake valves of the motor. In the visible model there is a glass gasoline container, mounted upon the dash and this is filled by turning a knurled nut. This permits the suction of the intake stroke to exhaust the air in the glass, and gasoline is drawn into it through the pipe connected to the main gasoline feed line. This ingenious method is one of the patented features of the system. Another knurled nut permits gasoline to be drawn from the glass chamber into the motor, so that as soon as the motor begins to turn the suction stroke draws in the gasoline, mixing it with the inrushing charge. In extreme weather the primer may be set to feed gasoline slowly, after the motor has been started, which will help to warm it up quickly.

Where the fuel is fed by pressure, vacuum filling is unnecessary and priming is accomplished the same as on the other models. Additional features in this type are provisions for feeding kerosene and so forth to the cylinders to soften or remove carbon and an economy feature by admitting air through the intake manifold.

Hoffecker-Evans Speedometer-Speedlock

The Hoffecker company, Boston, Mass., is featuring its steady hand speedometers combined with a new arrangement which acts not only as an ignition lock, but also as a speed governor. It is called the Evans speedlock and consists of a Yale lock inserted into the speedometer. In combination with this lock there is a movable disk with a series of figures corresponding with the speed indicator dial of the speedometer itself. The owner or driver can unlock this disk by the use of a Yale key, set the disk at a given figure—say 20 miles per hour—and the removal of the key makes it impossible to change the position of the disk without reinsertion. When the speed indicator of the speedometer reaches a figure corresponding with that shown in the slot in the speedlock, a short circuit connection is formed which cuts out the ignition spark and stops the motor. But as soon as the speed indicator falls away from the speed at which it is locked the short circuit is released and the motor starts automatically. The use of such an instrument provides a guarantee against law-breaking either by speeding at an unlawful rate or by theft, because in the first place the evidence of the lock probably would result in release in case of arrest for speeding and when the car is left at the curb and the speedlock placed at zero the motor can not even be started.

The mechanism of the speedlock consists beside the disk and lock, of a short-circuit wire which leads from the contact in the speedometer to a point in the ignition ahead of the motor distributor. Two wires are connected, one on the magneto plug and the other on the battery plug, into the same circuit and grounded on the engine frame. When the contact is formed, the ignition current passes on a continuous ground line, through the speedometer, into the front axle of the car and to the frame of the engine. The pinion gear of the speedometer at the wheel is sealed so that the connection cannot be broken without detection and if an attempt were made to disconnect the speedlock, where it joins the ignition line it would be necessary to put in a new ignition system. The speedlock adds $15 to the price of the Hoffecker speedometers.

Halladay Shock Absorber

A shock absorber especially designed for application to the Ford car and especially appealing to the Ford owner's pocketbook is the Halladay shock absorber, the product of the L. P. Halladay Co., Streator, Ill. It consists of a coil spring incorporated within a small metal housing and standing vertically. The axle ends of the spring shackles are attached to one member and the other member is bolted directly to the axle. The use of the Ford shackle is a feature of this shock absorber in that any side motion is taken up by the shackle and there is no tendency of the absorber to wobble sideways. The absorbers are adapted for both front and rear of the car and a set of four is listed at $12.50.

Johnson Shock Absorbers

The Johnson shock absorber is of the spring cushion type interposed between spring shackles. It consists of two coil springs, one within the other. One is of heavy stock and is stiff to take heavy shocks and the other is a re-coil check. These

are encased within a water and dust-proof cylinder. In the center of them is an adjustment bow, the adjustment being made by a nut at the bottom of the cylinder, and can vary to a range of 1,000 pounds. A special type is marketed by the Triple Action Spring Co., Chicago, for Ford cars at $22.50 for a set of two. Four different sizes are provided giving a range of vehicles as heavy as 5-ton trucks, for which $50 per set is asked.

Automatic Tire Rest

The Automatic Tire Rest Co., Kansas City, Mo., has on the market a garage jacking device which is designed to raise the entire car from the floor very simply. The lower portion of the device contains four small inclined blocks, up which the rollers carrying the raising portion run when the car is driven onto the apparatus. The device has a special advantage that it occupies no more space than the car itself requires and to operate, the car is driven directly over the jack until the front axle, coming in contact with a coil spring bumper on the front of the jack carries the rack forward and up on the inclines raising the car with it and holding all four wheels clear of the floor. Having reached the top of the incline a ratchet device catches and holds the upper portion in this position. When the car is again to be put in use a foot lever may be pressed to disengage the ratchet when springs aid in pulling the vehicle down the inclines until the car rests on the floor.

Marvel Tire Pump

Among the latest of the impulse tire pumps is the Marvel pump which is of the spark-plug variety, in which the pump is substituted for a spark plug and the engine used to pump the car. It is listed at $7.50, by the Marvel Auto Supply Co., Cleveland, O.

Gemmer Air-Starting System

The Gemmer-Detroit Starter Co., Detroit, Mich., is demonstrating its new air-starter system in which a single instrument performs the functions of both the air compressor and the air motor. This combined motor compressor is in reality a four-cylinder air pump mounted on the engine and driven from the timing gears. When running as a pump it stores up compressed air in a special tank which may be released either for tire inflation or for engine cranking. When air from the storage tank is admitted to the combination units it runs as a air motor and turns the engine over. This unit is connected to the crankshaft of the engine by suitable training gears, thus it will be driven by the car motor as a compressor at about half crankshaft speed, and when it is reversed and acts as a starter the speed of the motor compressor is reduced to about 7 to 1, thus spinning the crankshaft at a speed of about 200 revolutions per minute. The total weight of the system is about 35 pounds. A special installation has been developed for Ford Cars, designed with a view to quick application.

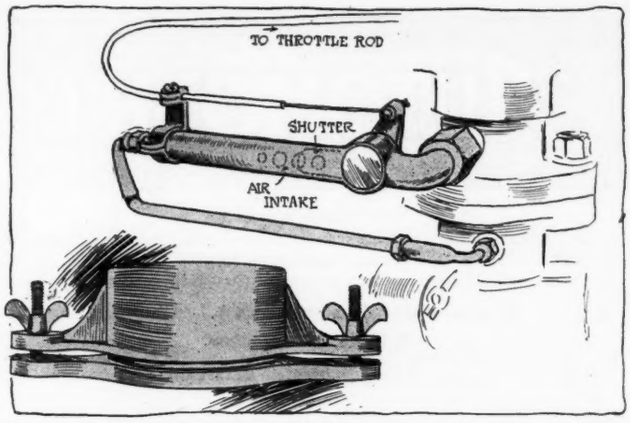
Arbeco Lamp—Has Glass Reflector

A novelty in lamp construction is the Arbeco, made for head lights, dash lights, etc., by the R-B Co., Chicago. This lamp differs from the conventional in that the reflector is of glass and the metal reflecting material is applied to the rear of this glass, much the same as an ordinary mirror is produced. This glass reflector is then inserted in the stamped shell leaving a wide air space between them and from which space the air is partly exhausted. The wiring is carried from the lamp socket through this middle zone, or air space, and thence through the hollow supporting iron on the top, whence it can be carried through the hollow lamp bracket, thus giving a concealed wiring system. Still another feature of the lamp is that the outer surface of the shell instead of being painted, enamelled or plated is finished with a glass deposit, approximately 1-32-inch thick. This shell is covered with molten glass, colored as desired, and then baked to approximately 16-100 degrees. This gives a particularly smooth and hard surface and one that is claimed to retain its lustre.

The promoters of this lamp draw attention to the glass reflector, pointing to the fact that this may be washed off the same as a surface of a mirror without in any wise tarnishing the reflector or reducing the brilliancy of the light.

Combination Gas Electric Headlights

The Auto Parts Co., Chicago, is featuring the P-G-N combination gas and electric headlights made by J. R. Pagin Lamp Co., Chicago. These lamps provide two lighting equipments in one. The dual equipments providing two pairs of efficient touring lights from different sources, one source being like an extra tire, always in reserve. The lamp itself consists of an electric headlight burner in the ordinary parabolic reflector and immediately above is an acetylene burner with the gas reflector. Midway between these are two small bulbs electrically operated, which act as signal lights, and without the dazzling brilliance of the headlight. All four lights are operated by buttons on the dash.



Above—Empire gasoline economizer for attachment to the intake manifold as shown. A plunger within is interconnected by wire to the throttle rod and varies the amount of air drawn in. Below—The Neverfail hot water vulcanizer

Empire Gasoline Economizer

A device for saving fuel is marketed by the Brown Taylor Green Co., Chicago. This is a small brass fitting which is designed for attachment to the intake manifold just above the carbureter, a hole being drilled in the former into which the device is screwed. It has a cylindrical or barrel form with a diameter of about 7-8 inch and a length of about 6 inches. Within the barrel there is a plunger which is interconnected with the carbureter throttle or it may be connected with a dash adjustment independent of the throttle. In the side of the cylinder there is a series of holes communicating with the outside air, the plunger within serving to close these holes in proportion to the amount of air desired. Thus, in operation if the plunger is pulled way out all the holes are open and allow the outside air to communicate with the manifold above the carbureter. Pushing this plunger further in less and less air is allowed to enter and if it is shifted to extreme inner position air cannot get through any of the holes. A shut off valve is interposed between the manifold connection and air intakes which valve is connected to the dash so that all air may be excluded if desired. Thus the economizer may be used as an auxiliary air valve and if properly interconnected with the throttle works automatically to give the right mixture with no excess of fuel. Economy as high as 50 per cent. is claimed for it over motor fuel consumption without this device.

Neverfail Hot Water Vulcanizer

Among the latest of the cheaper type of vulcanizers is the Neverfail vulcanizer, made by the Housel Mfg. Co., Rochester, N. Y. While of the open type, in which gasoline is burned with an open flame as in most of the lower priced devices of this nature, it has a feature of a hot water jacket, so that burning of the tube is impossible. The water is within the casting and consequently cannot evaporate.

Andersen Shock Absorber

The Andersen shock absorber consists of an auxiliary spring construction which is designed for attachment to any motor car springs already on cars. The absorber is made of the same sized steel as the spring to which it is attached and consists of four leaves bolted together at the center and gradually separating toward the end. In normal position the ends are 1-4 inch away from adjoining leaves. The absorber is attached to the top of the spring and becomes a part of it, each end of the top leaf being provided with an I and to this is attached an iron clip which passes under the main spring.

In its action this auxiliary spring absorber acts as a dampener of the rebound of the main spring just as any other type of shock absorber would. When the car hits a rut the spring travels downward and engages the clips of the Andersen device and therefore takes hold of the upper leaf of it. The greater the depression of the main spring the greater the number of leaves of the absorber that are brought into action. In the upthrow of the car the upper leaf of the main spring is drawn upward and immediately engages the lower leaf of the absorber which in this case remains stationary, engaging others of the auxiliary leaves in proportion to the upthrow of the main spring and thus checking the rebound action of the car. Thus, whatever the extent of the movement of the main spring enough of the absorber leaves are brought into play to resist its movement although the resiliency of the springs is obviously not hampered. The Andersen Spring Co., Detroit, Mich., makes this device.

The Automobile

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The Wave of Business

THE Chicago show, which has always been a good criterion of business for the ensuing season, has opened as auspiciously this year as in past seasons, and if the opinions of dealers and branch managers between the Mississippi and the Pacific coast, and from the Great Lakes to the Gulf, can be a correct estimate, there will be a good opening in business within the next three months. From sections that suffered from drought during the past season come reports of winter wheat for 1914. From other sections equally optimistic rumors are heard, and the entire West is looking to a good 1914 season.

The second-hand car dealer is invariably a safe barometer of the buying capacity of a section, and while several of the largest operators are not moving used cars rapidly at present, they are looking forward to good sales and are not worrying because of the present lull. In fact, they consider it good business to have rather a slack season at present in view of the increased trade and prices they anticipate with the opening of spring.

That ready money is becoming more general throughout the country is evidenced by the brisk demand for accessories intended for medium-priced cars, which demand is greater today than it has been for the last 6 months. Many of these accessories are purchased by the farmers and working classes, and their sale can only be interpreted as meaning a freer circulation of money in their territory and a general tone of expectancy of the return of normal business conditions.

From the West comes reassuring reports of increased business in lines not allied with the motor industry. Railroad appliance companies report increased demands, which are undoubtedly due to increased passenger and freight traffic in local sections rather than on through routes. Candy manufacturers report an increased demand for machinery and other necessaries in connection with the confectionery trade, demand for which has been at a low ebb during the last 5 or 6 months, but is experiencing a healthy increase at present. This, too, can be traced to greater demand and freer circulation of money in local circles.

There is only one answer to this renewed public confidence, which has been evidenced on Wall street during the past 10 days and has been exhibiting itself in local sections of the country for the past 3 weeks, namely, that there is a general feeling of returning business and that with the opening of spring an unexpected demand, not only for motor cars, but commodities in general, will be looked for.

Cold Weather Carburetion

THE problem of carburetion is being worked out more mathematically today than ever before. Some of the leading carbureter makers are wrestling with it so hard that their researches and calculations are reaching the fifth decimal place, figuratively speaking. These makers are going after the question sanely, logically and determinedly. Instead of pursuing a hit-and-miss policy of having something new for each successive season, they are relegating the spectacular to the background and going after those factors that count, those that determine efficiency in carburetion.

Making starting easy, even with self-starters, is one of the present missions of the art, and the makers are rallying on two sides in this work; those who are aiming to make starting easier by giving more gasoline by furnishing a dash adjustment on the gasoline nozzle, enabling them to give more fuel to start with. The other side takes the stand that the gasoline nozzle should be left alone, but the auxiliary air valve held under a stronger spring tension for starting and general running in cold winter weather. Both parties are obtaining results, but it is only with a laboratory test that the relative merits of the two systems could be definitely determined.

That something must be done to make starting easier is apparent from an analysis of gasoline and air, the two constituents that go to make an explosive mixture of the desired richness. The rate at which gasoline will flow from a spraying nozzle in a carbureter depends on the temperature. Authentic figures show that the flow of gasoline through a nozzle at a temperature of 122 degrees Fahrenheit is 65 per cent. faster than through the same nozzle at 42 degrees temperature. The latter temperature is the one the driver is confronted with on an average winter morning, and the 122 mark is the one reached under the bonnet of any motor car after the motor has been running for half an hour, or, in the vernacular, becomes warmed up.

This jump of 65 per cent. in the flow of gasoline through a nozzle in a matter of one-half hour, perhaps less, is a factor that cannot be overlooked. It is entirely too important to be neglected in any way. Look at its

meaning: If you are to have a satisfactory running mixture after the motor is warmed up, and this 65 per cent. increase in the gasoline gives you such a mixture, then you have anything but a satisfactory mixture when starting and while running until warmed up. In other words, you are having a mixture one-half too lean for starting and warming up, whereas you should have a somewhat richer mixture. This 65 per cent. difference in the rate of fuel flow at a temperature of 42 degrees as compared with the running temperature of 122 degrees demonstrates that although many owners imagine that they are giving a richer mixture when starting by lifting the needle valve from the nozzle, or other means, they are in reality not doing so, but are only in a measure compensating for the reduced flow in the gasoline at this lower temperature.

This increase of 65 per cent. in the rate of flow is sufficiently conclusive to prove that every carbureter must have some adjustment whereby this difference in condition is going to be taken care of in cold weather. To do it, as previously mentioned, some aim at increasing the nozzle opening, and others at adding tension to the auxiliary air valve spring, thereby restricting the flow of air and aiming to increase the proportion of gasoline to air in the mixture.

The value of controlling the air supply instead of the gasoline supply is founded on the fact that gasoline and air should be mixed in approximately a 1 to 15 ratio by weight in order to give the best combustion. A cubic foot of air will weigh more at a temperature of 41 degrees than at 122 degrees. In other words, air expands proportionally with increase in temperature, and the higher the temperature the lighter the weight of a given volume. This fact has been seized upon by some of those carbureter makers controlling the adjustment of the auxiliary air valve, and they advance the fact that by such control easy starting is made possible and that there is not any waste in the consumption of gasoline, but rather they simply maintain the due proportion by weight of 15 to 1, thereby furnishing a mixture of the best explosive consistency irrespective of temperature.

During the past month a thermostatic device has been introduced which is fitted to carbureters and which controls the tension on the auxiliary air valve spring by means of a liquid highly sensitive to changes in temperature. Commendable results are being obtained by its use, and it is expected that with carbureter improvements and the use of these devices it will be possible to eliminate many of the troubles, considered inherent, in carburetion in cold weather. The enthusiasts of these devices are concerted in the one thought that it is possible to furnish satisfactory carburetion in cold weather as well as in hot, if the laws of gasoline and air are correctly interpreted and the carbureter operates in conformity with them.

Economic Aspects of Ford Profit-Sharing Plan

System Does Not Offer a Solution to Labor Problems, According to Professor Taylor of Michigan

DETROIT, MICH., Jan. 27—Almost every possible side of the Ford profit-sharing plan has been discussed at length in the newspapers but few authentic interviews have been published from men who have made a special study of the social sciences. Following are the remarks of Prof. Frederick M. Taylor, head of the Department of Political Economy of the University of Michigan.

"The most interesting aspect of the scheme from the standpoint of the economist is the claim put forward by some that we have here a new departure which promises to furnish a solution of labor troubles. Nothing could be more chimerical. In so far as this plan differs from the ordinary profit-sharing scheme it has no chance of permanence in this particular case and no chance of general adoption. Its peculiarity is that a particular industrial concern gaining almost unheard of profits agrees to pay to its employees bonuses of such magnitude as to more than double their wages. Surely this has no place as a general remedy for low wages. First, most concerns are not getting profits of any such magnitude—with the utmost liberality they could raise wages perhaps a few per cent. Secondly, the few other employers who are receiving extraordinary profits will surely not hasten to imitate Henry Ford and his fellows—human nature is not made this way. In the third place, there is no chance whatever that the Ford company will be permanently in receipt of any such exceptional profits—it will have no ten millions to distribute as bonuses in a few years. The reason is plain to any person of business experience. When any industry has passed through its youth where competition has become fully established, prices inevitably rest at a point which covers only cost inducing ordinary profits. That the present condition has lasted so long is surely a matter of surprise. That it will continue indefinitely is quite impossible.

Desirability of the Scheme

"Another question which an economist is bound to raise concerns the reasonableness or desirability of such a scheme as this. Ought employers in receipt of such exceptional profits to turn over a large share of them to their workmen? Ought one to favor or insist on such a policy? Surely a negative answer is the only reasonable one. Such exceptional profits may be viewed as partly earned, partly unearned. That is, in part they are fairly attributable to the superior foresight, courage and managerial skill of the employer; in part they can be explained only as the result of the growth of scientific knowledge, population, general wealth, a peculiar conjuncture of circumstances which no one could anticipate. Now, in so far as such profits are of the earned sort, there is no sound reason for insisting on their being relinquished at all by the owners of the business. With the unearned part the answer is no doubt different—being, by hypothesis, unearned, the owner of the business ought perhaps to be required to give them up. But to whom? To the employees of the concern? Why to them any more than to you or me? By hypothesis they are not earned, and so are not earned by the workmen any more than by the employer. Surely, the solution of the followers of George or the Socialists is more reasonable. If these unearned profits are to be redistributed at all, they should go to society at large rather than to any particular class, to all workmen, if you please, rather than to some small group. It will, of course, always be difficult to distinguish the earned from the unearned profits. It will also be difficult to find some method of appropriating for society the unearned share without working more harm than good. But, if anything is to be done, it surely should be along these lines, using more fully methods already in vogue, franchise taxes, heavy inheritance taxes, progressive income taxes, and so on."

Court Says Dazzling Lights Are All Right

NEW YORK CITY, Jan. 26.—Many of the motorists throughout this city, who have been fined on charges that they violated a city ordinance in having dazzling lights on their machines will be interested in the case of G. E. Brower, who was arrested on December 21 for having a dazzling light, but who was discharged in the Jamaica police court last week, after he had filed a brief on the question. In his brief, Brower, who is a lawyer, contended that it was not a violation to have a dazzling light on his automobile, even if the Board of Aldermen did enact such an ordinance. He claimed that the ordinance was not effective because the corporation counsel did not file it with the secretary of state. As the result of his discharge following his contention that the dazzling light ordinance was non-effective, at least twenty-five motorists, who have been fined under it, have filed appeals.

Nobby Tread Patent Void

Court Decides That Because of Lack of Invention G. & J. Factory of the United States Tire Co. Has Not Infringed on Republic

CHICAGO, ILL., Jan. 27—The United States Circuit Court of the Seventh District has decided that the Mell patent, No. 898,907 for improvements in tires for vehicle wheels is invalid, and not infringed by the tire made by the G. & J. Factory of the United States Tire Co.

The invention is designed especially for use in connection with tires of the pneumatic type employing inner inflatable tubes. The invention resides primarily in certain novel features of construction relating to the outer or tread-surface and equally applicable to all forms of resilient tires. Tod J. Mell, of Youngstown, O., and assignor to the Republic Rubber Co., of that city, is the inventor. His patent covered certain traction or road gripping qualities; tires that reduced to a minimum all side skidding tendencies under varying loads and road conditions, by the use of a multiplicity of elongated projecting studs, molded integral with the body of the tire. These are arranged longitudinally with relation to the circumference or length of the tire, and parallel with no relation to each other. These studs are counterparts one of the other, and are, individually considered, of substantially rectangular or elongated outline, they are preferably flattened upon their outer surfaces and are formed with full rounded ends, which like the sides are widened at the base and are joined to the surface by a heavy fillet which latter accordingly surrounds and reinforces each of the said studs. They extend around the entire surface in endless succession, and in parallel rows or series.

By this arrangement the spaces between adjacent studs are of outwardly diverging form, the better to clear the structure from mud and foreign matter, which might otherwise accumulate and be compressed between them, thereby impairing their usefulness as anti-skid contrivances.

First Declared Invalid in 1911

In 1911, the Republic company brought suit against Morgan & Wright and it was held that the patent was invalid, having been anticipated by the Healy British patent. The Republic company then brought suit against the G. & J. company in another circuit in August, 1912, in Indianapolis. Prior actions in the United States District Court had been favorably decided toward the patent by Judge Hazel, who sustained it generally and held that the defendants in the suit had infringed.

Judge Baker delivered the opinion stating that the Mell patent was quite fully considered by the Circuit Court of Appeals for the Second Circuit in the Case of Republic Rubber Co. vs. Morgan & Wright. "In view of the prior art," says the Judge, "and the nature of the alleged improvements it was held that the patent was void for lack of invention."

Mell Tread Similar to Healy

He then goes on to say in his decision, "In both records appear the Healy patent and other structures of the prior art and also the testimony in relation to what Mell actually did in producing his tire. The Healy tire was for bicycles, and the Mell tire was designed especially for use on automobiles. But Healy, for the use of bicyclists, sought to accomplish the same objects which Mell later sought for automobilists, namely, the improvement of road-gripping and anti-skidding qualities. To accomplish this, Healy devised a tire provided with outwardly projecting, circumferentially arranged, elongated studs, in parallel lines, and arranged so as to break joints; and each stud considered separately had a base which was relatively larger than its bearing surface, and necessarily had walls which diverged toward the base. The only difference between the Healy and Mell tires, apart from the difference of dimensions between a bicycle tire and an automobile tire, and the size and number of studs, is that the outer surface of the Healy stud is rounding while the outer surface of the Mell stud is flat."

He goes on to say that Mell, in trying out the Healy tire for automobile use, at once observed what details should be changed and instantly suggested how to change them.

"We agree with the Circuit Court of Appeals for the second circuit that in so doing Mell employed nothing higher than the ordinary knowledge and skill of a mechanic versed in the art of rubber manufacture, as that art stood prior to the filing of his application."

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Klaxon Brings Suit Against Nonpareil

NEW YORK CITY, Jan. 23—The Lovell-McConnell Mfg. Co., Newark, N. J., has brought suit in the U. S. District Court of the Southern District of New York, for an injunction, accounting and damages against the Nonpareil Horn Mfg. Co., of this city, on its hand-operated horn, called the Pilot horn. The complainant claims infringement on the Patent Nos. 923,048, 923,049 and 923,122. The opinion of Judge Chatfield which was given in THE AUTOMOBILE of Jan. 15, is cited as one of the grounds for granting the preliminary and permanent injunction asked for.

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NEW YORK CITY, Jan. 27—Lovell-McConnell Mfg. Co. has brought motion for a preliminary injunction in its suit against the A. Elliott Ranney Co., eastern distributor of Hudson cars. The order to show cause and temporary restraining order was signed by Judge Mayer, of the District Court for the Southern District of New York on January 26 and the order is made returnable January 30.

The papers in support of the motion recite the prior favorable adjudication of the Klaxon patents in suit by Judge Chatfield in the suit against the Newtone as basis for a restraining order and preliminary injunction. The moving papers also allege that the infringement consists of the sale of Hudson cars equipped with the Sparton horn as well as sale of horns separate from the car. It is alleged that the Hudson M. C. Co. is a party in interest insomuch as it furnishes the defendant with the infringing articles and guarantees the defense. The Sparks-Withington Co., maker of the Sparton, are also alleged to be parties in interest because it furnishes Sparton equipment to the Hudson M. C. Co. and undertakes the defense of the suit by paying the expenses and putting its own patent counsel in charge.

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Bosch Sues on Alleged Magneto Infringement

NEW YORK CITY, Jan. 27—The Bosch Magneto Co., of this city, has brought suit against F. A. Baker in the U. S. District Court of the Southern District of New York of an alleged infringement of the Pat. No. 900,542, issued to Gottlieb Honold on Oct. 6, 1908. The alleged infringements are on improvements in magneto-electric generators. The complainant prays for a writ of injunction and accounting. Baker is a dealer in Brooklyn selling motorcycles made by the Hendee Mfg. Co., Springfield, Mass., on which the complainant alleges there are magnetos infringing on the Honold patent.

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Parts Co. Sues Rauch & Lang

INDIANAPOLIS, IND., Jan. 26—The Lindsay Auto Parts Co., which holds the patents to the Lindsay axle, has brought suit against the Rauch & Lang Carriage Co., to collect $3,600 royalty, alleged to be due. Judgment is asked in the sum of $5,000.

It is alleged that on January 27, 1911, the defendant entered into a contract with Thomas J. Lindsay and Willard Harmon, who have since been succeeded by the Lindsay Auto Parts Co., under which it was to pay one-quarter of 1 per cent. on the retail list price of all electric vehicles manufactured by the concern, as royalty on the axles. It is alleged the Rauch & Lang Carriage Co. has since manufactured 2,300 cars, listed at $6,440,000 and on which a royalty of $16,100 should be paid. The sum of $12,500 is said to have been paid in advance, but it is alleged $3,600 is still due.

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Used Car Dealers Must Have Licenses

NEW YORK CITY, Jan. 27—The automobile dealers along Broadway have received notice that they must take out licenses to deal in used cars. These licenses are the same as are issued to "second hand" men in other lines. Even if they are not in the second hand car business exclusively, but handle used cars as part of their trading in system, they come under the same conditions, they are told, and must be licensed.

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Canadian Automobile Federation Formed

TORONTO, ONT., Jan. 24—The meeting held a few days ago at the offices of the Motor League, Lumsden Building, Toronto, at which the great Canadian Automobile Federation was formed for good and all, was pregnant with interest, and promise of future progress.

The nucleus of a constitution was drafted and the officers for 1914 were appointed as follows:

President, Oliver Hezzelwood, Toronto; first vice-president. Frank Carrel, Quebec; second vice-president, G. H. Cottrell, Vancouver, B. C.; secretary-treasurer, W. G. Robertson, Toronto.

No manufacturing interest is eligible for membership of the federation, which is restricted to properly organized motor clubs throughout the Dominion. The present membership totals twenty-five clubs, extending from British Columbia to Prince Edward Island.

The aim and scope of the new organization is chiefly legislative. Besides paying attention to Dominion legislation in the matter of State roads and national highways, it will endeavor to standardize provincial laws, taxes, etc., and have certain portions of the motor taxes set aside by the individual governments to cover, or partially cover, the cost and maintenance of good roads.

Cyclecar Not in Motorcycle Class

PHOENIX, ARIZ., Jan. 26—Secretary of State Sidney P. Osborn has ruled that a cyclecar is a motor vehicle under the Arizona law and must be registered as such. Cyclecar owners claimed that these machines should be classed as motorcycles, as they have light engines, but Osborn has ruled that any motor driven vehicle on four wheels is an automobile. The registration fee for motorcycles is $2, while for cars of 25 horsepower and under it is $5.

Partridge, Clark & Kerrigan Get Briscoe

NEW YORK CITY, Jan. 26—The local agency for the new Briscoe car has been awarded to Partridge, Clark & Kerrigan, Inc. The new firm is composed of Ernest S. Partridge, J. J. Clark and J. J. Kerrigan, and was formed for the express purpose of handling the Briscoe car. The territory allotted under the new arrangement includes Manhattan, Brooklyn and all of Long Island.

Mr. Partridge is one of the pioneers of the automobile industry and for years was member of the firm of Wyckoff, Church & Partridge, eastern distributors of the Stearns and other cars. Mr. Clark has represented the Peerless car in New York since the early days. Mr. Kerrigan has not been identified with the automobile trade, but has been successful in other commercial lines. Temporary offices will be maintained with the Briscoe Motor Co., at Broadway and Fifty-ninth street.

Court Sustains All Claims of Battery Patent

CHICAGO, ILL., Jan. 28—*Special Telegram*—Judge Thompson yesterday handed down a decision in the Third District Court of Pennsylvania in favor of the Electric Storage Battery Co. of Philadelphia, in its suit against the Philadelphia Storage Battery Co., sustaining all claims of the Dodge patent on prepared wood separators for batteries and calling for an accounting. The decision is regarded as important as all makers use this separator. The suit was in court 18 months and was regarded as a test case.

Motokart Reduces Price to $365

TARRYTOWN, N. Y., Jan. 24—The price of the Motokart has been reduced to $365, it formerly listing at $400. The maker, the Tarrytown Motor Car Co., announces that this cut has been made because in the initial announcement the price was purposely put at a figure that was high enough to cover all contingencies, realizing that it is far easier to lower the advertised selling price than to raise it. The present figure is based on actual costs figuring a fixed percentage of profit.

Perfection Spring Gains 45 Per Cent.

CLEVELAND, O., Jan. 26—The Perfection Spring Co. reports that business the last half of 1913 showed an increase of 45 per cent. over the same period in 1912. The December sales were the largest in the history of the company for a single month. From July 1 to December 31 sales totaled $550,525. A year ago the figures were $394,430. In December the company shipped springs to equip 9,650 cars, the daily weight of the shipments averaging 58,000 pounds. In a year the working force has been increased from 231 to 400 men.

DETROIT, MICH., Jan. 28—The firm of Castle & Monson, of Detroit, has been dissolved. F. E. Castle having purchased the interest of C. S. Monson. The business will be continued at the main office in Detroit at the same address with a branch office established at Indianapolis, Ind., with a capable resident manager in charge. The new company, to be known as the Fred E. Castle Co., will continue to handle the output of the various factories which it has been connected with in the past.

Plug Makers To Organize

Philadelphia Motor Mart Established—Court Says Cyclecar Not in Motorcycle Class — Court Sustains Dodge Patent

NEW YORK CITY, Jan. 24—In pursuance of the plans outlined at the meeting of spark plug manufacturers held at the Hotel Astor on Jan. 5 for the purpose of forming an association, there will be held a second meeting during the Chicago automobile show, in the Auditorium Annex on Jan. 29. At this time the leading spark plug manufacturers or their representatives will adopt a constitution for the organization, which is to be known as the Association of Spark Plug Manufacturers.

This association will include all present licenses under the Canfield spark plug patent, which is controlled by A. R. Mosler & Co., Mt. Vernon, N. Y., likewise a number of prospective licensees. The association will include manufacturers of complete plugs, or parts thereof.

The association hopes to reform certain abuses now found in the trade and to secure for its members freedom from unjust and unlawful exactions. Accurate and reliable information as to the standing of concerns dealing with members, conditions and developments in the trade, etc., will be gathered and disseminated among the members. The association will work for the enactment of just and equitable laws affecting the members, also to act as a neutral body to settle differences between members.

Makers of spark plugs who are not already licensees under the Canfield spark plug patent will be licensed under terms which are by no means prohibitive for any manufacturer. They will be licensed regardless of their attitude toward this patent in the past. The Canfield patent is a broad one, covering both petticoat and conical type of spark plugs which have a recess deeper than their diameter around the electrode. This feature is found in all of the best known spark plugs on the market. The patent was upheld recently in the United States Circuit Court of Appeals.

Citizen's Street Traffic Committee Organizes

NEW YORK CITY, Jan. 28—The Citizens Street Traffic Committee of Greater New York was organized yesterday at a meeting held at the Automobile Club of America. It is the purpose of the committee to examine into existing conditions of congestion and render what service it can to the municipal authorities in bettering them. One of the resolutions passed was that a deputy commissioner be designated whose sole duty should be to regulate traffic matters, and that a committee of five experts, one from each borough, be appointed to advise with him.

Robert Grier Cooke, president of the Fifth Avenue Assn., was elected chairman and Elmer Thompson, secretary of the Automobile Club of America, was elected secretary; G. H. Duck, president of the Motor Truck Club, G. H. Pride, A. B. Cumner and Harry Robinson, were a few of the automobile people present.

Philadelphia Motor Mart Established

PHILADELPHIA, PA., Jan. 24—As an outgrowth of the recent automobile show in this city a Motor Mart has been established, with headquarters at Nos. 633-635-637 North Broad street.

A number of accessories dealers, unable to secure space in the Metropolitan Building, where the show was held, conducted an independent automobile accessories exhibition during show week. So successful did the venture prove that a number of dealers have banded together and will maintain a permanent exhibit. The Motor Mart will afford innumerable advantages and prove a source of convenience, in that it will be possible to have demonstration and salesroom under one roof.

King Co. Gives Dinner to Parts Makers

DETROIT, MICH., Jan. 23—A good-fellowship dinner for the parts manufacturers who have been furnishing parts to the King Motor Car Co. during the year past was given by the King company last night at the Fellowcraft Club. Over a hundred were in attendance at the affair which served to make a closer bond between the motor car manufacturer and those from whom it receives the ingredients of its machines.

There were ninety-one representatives of these firms, besides press and other visitors and the officers of the King company.

Cyclecar Makers Form National Association

Organization Comprises Thirty Makers —W. H. McIntyre President

CHICAGO, ILL., Jan. 27—America has a National organization of cyclecar makers, the same being formed here today by some thirty makers of these new vehicles and their accessories under the name Cyclecar Manufacturers' National Association, C. M. N. A.

Following the organization a definition of a cyclecar was arrived at, the movement being divided into three branches according to the report and suggestion of a committee, the divisions being as follows:

Vehicle	Motor—Cu. In. Displ.	Weight, lbs.
Cyclecar	to 70	under 750
Light car	70 to 100	under 750 to 950
Small car	100 to 125	950 to 1150

After the definition was arrived at, to know who was eligible to the organization, officers were elected as follows:

President, W. H. McIntyre, Imp Cyclecar Co.; vice-president, Harry Stoops, American Cyclecar Co.; treasurer, J. P. Lavigne, J. P. L. Cyclecar Co., and secretary, William B. Stout, Stout Cyclecar Co.

The definition of a cyclecar was arrived at after considerable discussion by all parties concerned. The committee deciding was made up of men representing all the types of cars and all were very well satisfied with the final recommendations. It is probable that these will be the official definitions of the cyclecar recognized for all America for the future.

The officers of the organization were appointed as a committee together with Ross Phelps of the Zip Cyclecar Co. and C. A. Albertus of the Mercury Cyclecar Co. to draw up the constitution and by-laws for the consideration of the association at a later meeting.

A committee, consisting of Mr. Phelps, Mr. McIntyre and Mr. Perry, of the Comet Cyclecar Co., was appointed to look into the matter of freight rates and classification for cyclecars, makers having now to pay rates very much in excess of other merchandise of the same class, with a minimum weight of 2,000 pounds in many cases where the cars crated come well under 900.

Goodyear May Add Over $4,000,000

NEW YORK CITY, Jan. 28—The Goodyear Tire & Rubber Co. has announced a meeting of the stockholders for March 3, to act on a proposition to increase the preferred stock from $5,000,000 to $7,000,000, and the common from $5,038,800 to $8,000,000.

The financial plan calls for a common stock dividend of 20 per cent.; the sale of $1,500,000 common stock at par to common stockholders; the sale of $2,000,000 preferred and $500,000 common at par to preferred stockholders. This provides $4,000,000 new capital. The sale of the stock has been underwritten.

Canadian Goodyear Elects Officers

TORONTO, ONT., Jan. 26—At the recent annual meeting of the Goodyear Tire & Rubber Co., of Canada, Ltd., the following officers were elected for the current year: President, F. A. Seiberling; vice-president and sales director, R. P. D. Graham; treasurer and general manager, C. H. Carlisle; secretary and assistant treasurer, C. J. Oille; superintendent, E. H. Koken.

Truck Standards in Card Form

NEW YORK CITY, Jan. 27—Sets of cards showing the various commercial vehicle standards recommended in 1912 by the National Association of Automobile Manufacturers are being mailed to all manufacturers of commercial vehicles by the National Automobile Chamber of Commerce, Inc., successor to the National Association of Automobile Manufacturers and the Automobile Board of Trade.

There are seven cards in the set, all of uniform size, 8 by 10 inches, scored in the middle so that they can be filed flat. Subjects are as follows:

Standard warranty, standard speed rating, standard body weight allowance, overload allowance resolution, standard caution plate, standard frame widths and lengths, and standard demonstration charges.

The warranty is a new form approved December 3, 1913, and supersedes the motor truck warranty recommended by the N. A. A. M. in 1912. It is a combination of this with the standard passenger car warranty adopted in 1910, and covers both commercial and passenger vehicles.

DETROIT, MICH., Jan. 26—Jos. D. Porter has succeeded W. G. Houck as sales manager for the American Voiturette Co., manufacturer of the Keeton and Car-Nation cars. Mr. Houck's resignation was accepted on January 21 and Mr. Porter assumed charge immediately.

Stewart-Warner Earns $1,145,132

NEW YORK CITY, Jan. 27—The net earnings of the Stewart-Warner Speedometer Co., after charges, for the year 1913 were $1,145,132, or equivalent to 10 per cent. on the common stock after payment of the 7 per cent. dividend and the sinking fund on the preferred stock. The net earnings for the last quarter of the year was $344,771. The profit and loss surplus of the company on January 1, 1914, was $573,027.

Acklin Co. Increases Sales 50 Per Cent.

TOLEDO, O., Jan. 23—As a result of the meeting, just held, of the stockholders of The Acklin Stamping Company, manufacturers of stampings for automobiles, J. M. Acklin was elected vice-president and general manager; W. C. Acklin, secretary and treasurer, and D. T. Anderson, superintendent.

The reports submitted to the stockholders showed that the year 1913 had been the most prosperous in the history of the company, the net sales being 50 per cent. greater than the preceding year. Although two extensions had been made to the plant during the past year, the board of directors authorized a committee for a further enlargement. All the indications point to a highly prosperous business for the coming year.

Automobile Securities Quotations

No changes of any importance occurred in this week's automobile securities quotations. Vacuum oil rose 14 points while Goodyear Tire common dropped 10 points.

	1912 Bid	1912 Asked	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co., com	160	185	195	..
Ajax-Grieb Rubber Co., pfd	95	100	98	101
Aluminum Castings, pfd	99	101	97	100
Chalmers Motor Company, com	..	..	..	92
Chalmers Motor Company, pfd	..	..	93	95
Firestone Tire & Rubber Co., com	357	365	244	252
Firestone Tire & Rubber Co., pfd	105	107	105	..
Garford Company, preferred	100	102	80	90
General Motors Company, com	33	34½	45	47
General Motors Company, pfd	76	78	84	85½
B. F. Goodrich Company, com	63	63¾	22	22½
B. F. Goodrich Company, pfd	104	105	86½	87½
Goodyear Tire & Rubber Co., com	445	452	225	235
Goodyear Tire & Rubber Co., pfd	104	105	98	100
Gray & Davis Co., preferred	..	..	90	100
Hayes Manufacturing Company	..	90	..	..
International Motor Co., com	5	15	..	5
International Motor Co., pfd	25	50	..	15
Kelly-Springfield Tire Co., com	19½	21½	52	54
Kelly-Springfield Tire Co., pfd	70	80	121	125
Kelly-Springfield Motor Truck Co., com	..	..	40	60
Kelly-Springfield Motor Truck Co., pfd	..	..	90	105
Lozier Motor Company, com	..	..	..	15
Lozier Motor Company, pfd	..	..	..	65
Maxwell Motor Company, com	..	..	4	5
Maxwell Motor Company, 1st pfd	..	..	27½	28½
Maxwell Motor Company, 2nd pfd	..	..	8	9
Miller Rubber Company	160	170	124	130
New Departure Mfg. Co., com	..	..	120	125
New Departure Mfg. Co., pfd	..	..	102	104
Packard Motor Company, pfd	103	105	95	100
Palmer & Singer, pfd	..	..	..	65
Peerless Motor Company, com	..	..	15	25
Peerless Motor Company, pfd	..	..	75	80
Pope Manufacturing Co., com	32	34	1	2
Pope Manufacturing Co., pfd	76½	78	8	12
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	11½	12	6½	7½
Reo Motor Car Company	20½	21¼	14⅞	15⅜
Rubber Goods Mfg. Co., pfd	104	108	105	115
Russell Motor Car Co., com	..	..	..	40
Russell Motor Car Co., pfd	..	..	..	70
Splitdorf Electric Co., pfd	..	..	40	50
Stewart-Warner Speedometer Co., com	..	..	52	*53
Stewart-Warner Speedometer Co., pfd	..	..	94	*98
Studebaker Company, com	20¼	21¼	26	26½
Studebaker Company, pfd	34	35½	76¾	77⅛
Swinehart Tire Company	110	112	69	71
U. S. Rubber Co., com	65½	66	62	62½
U. S. Rubber Co., 1st preferred	107	107¼	102½	103¼
Vacuum Oil Co.	..	..	213	216
White Company, preferred	105	108	105	110
Willys-Overland Co., com	70½	71½	64	66
Willys-Overland Co., pfd	98	99	92	95

*Ex-div.

To Make Overlands In Canadian Factory

Though Willys Heads New Company, It Is An Independent Concern

HAMILTON, ONT., Jan. 26—After negotiations extending since the early part of December, the Willys-Overland Co. of Canada, Ltd., has decided to locate a Canadian factory in Hamilton. The purchase of the Schacht motor plant on Cumberland avenue, for $42,500, has already gone through. The new company will take possession on February 1, and immediately afterwards will start to distribute its cars for the Canadian and British trade.

It is probable that by early spring 200 men will be employed. The assembling of cars from parts shipped from the company's American plant will be the first activity, although several Canadian concerns, and local ones, too, will benefit in supplying raw material. As the business progresses, the plant will be extended and new buildings erected, until later a modern motor car factory will be in operation.

The name of the new company is to be the Willys-Overland Co. of Canada, Ltd.

The Willys-Overland of Canada, Ltd., is an organization distinctly separate from any other concern. The president, however, will be J. N. Willys, who is also president and general manager of the Willys-Overland Co. of Toledo. O.

Marion Out of Receiver's Hands

INDIANAPOLIS, IND., Jan. 26—The receiver for the Marion Motor Car Co., was discharged in the Marion County superior court last Saturday afternoon, and the company is now operating its property again. James E. Kepperley was appointed receiver on November 3, on a petition filed by the Kinsey Mfg. Co. The receiver was dismissed after he had shown that the company is in good condition financially.

H. J. Hayes, of Detroit, and Isaac Kinsey, of Toledo, have been added to the company. Mr. Kinsey will be chairman of the board of directors, which will include J. I. Handley, president; H. J. Hayes, vice-president; J. M. Edsall, treasurer; James E. Kepperley, secretary and Mr. Kinsey.

"The company will go ahead as though it had never been in the hands of a receiver," said an officer of the company. "The outlook appears very bright to us. We have practically the same old organization, which stood by us during the temporary trouble. We are exhibiting at the Chicago show."

The receiver was appointed last November as a protective measure, the company contending that it was solvent. The report of the receiver shows that the assets and holdings of the company are in excess of $800,000. The court has allowed the receiver $3,500 for his services and the attorneys for the receiver $1,500 for their services.

Columbus Buggy Reorganized—$500,000 Capital

COLUMBUS, O., Jan. 24—The new Columbus Buggy Co., of Columbus, O., was incorporated January 24 under the laws of Ohio with a capital of $500,000, all common stock. The incorporation was done by the creditors of the former company, which have been operating the plant, located on Dublin avenue for the past 8 months. The claims against the old company amount to $464,000, which will be taken up and stock in the new company issued. This will give an addition of $36,000 for organization expenses.

George W. Lattimer was elected president; E. R. Sharp, vice-president; D. N. Postlewaite, secretary, and George W. Bright, treasurer. The board of directors consists of O. A. Miller, George W. Bright, George W. Lattimer, E. R. Sharp, F. O. Schoedinger, Robert H. Jeffrey and T. J. Cavanaugh.

The organization as it now stands includes 85 per cent. of the creditors of the company.

Tire Guarantees Reduced 1,000 Miles

NEW YORK CITY, Jan. 27—The B. F. Goodrich Co., the Kelly-Springfield Tire Co., the Goodyear Tire & Rubber Co., and the U. S. Tire Co., have come down in the guaranteed mileage of solid truck tires. The reduction is from the former 8,000 miles to 7,000 miles, the ascribed reasons being that not only are the tires terribly abused under excessive guarantee, but trucks themselves. It is thought that with a reduced mileage basis of replacement owners will see to it that trucks are operated more carefully, so that the tires will last longer than 7,000 miles.

The Goodyear company states that it expects to reduce to 7,000 miles when tires are used on gasoline trucks, and 8,000 miles on electrics. The Goodrich company announces that all guarantees on its wireless type solid tires have been reduced from 8,000 to 7,000 miles, beginning January 1. The U. S. Tire Co. has reduced its guaranty on solid truck tires used on gasoline vehicles from 8,000 miles to 7,000, the guarantee on electrics being left at 8,000 miles. The Kelly-Springfield Tire Co. has given a like reduction. This company has gone a step further and established an additional time limit of 1 year on gasoline truck tires and 18 months on electric truck tires, after which the guarantee is invalid regardless of mileage traveled.

Lee Tire's New Rubber

CONSHOHOCKEN, PA., Jan. 23—The Lee Tire & Rubber Co. is using the new Vanadium rubber, just introduced by that company, in the new Lee Velvet red inner tubes and its other products. The company claims for it increased life, elasticity, vitality and toughness.

Nyberg Sale for February 16

ANDERSON, IND., Jan. 24—The United States Court has directed Fred Van Nuys, receiver for the Nyberg Motor Works, Anderson, Ind., to sell the property to the highest bidder on February 16. The property, including accounts has been appraised at $75,175.07. Henry Nyberg figured on taking over the property but abandoned the plan when he found he could not finance it.

Amplex Sale Extended to February 20

SOUTH BEND, IND., Jan. 26—On the petition of M. W. Mix, receiver for the Amplex Motor Car Co., of Mishawaka, in the circuit court, a month's additional time has been granted in which to dispose of the assets of the company. The sale was to have been made January 20, but the time has been extended to February 20. The extension of time was agreed to by a majority of bondholders of the company.

Market Changes of the Week

The usual changes occurred this week in the market reports. Tin rose $1.25 per 100 pounds. In the local market the higher prices induced some taking of profits by operators. Antimony was steady. Lead remained dull but steady at $4.07 1-2 per 100 pounds. There was a small demand for electrolytic copper both here and in Europe, which experienced a slight gain for the week in price. Rapeseed oil rose $0.01, while cottonseed oil dropped $0.14 per barrel.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Changes
Antimony	.06	.06	.06	.06	.06	.06	.....
Beams & Channels, 100 lbs.	1.31½	1.31½	1.31½	1.31½	1.31	1.31	— .00½
Bessemer Steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Copper, Elec., lb.	.14 7/20	.14⅜	.14⅜	.14⅜	.14⅜	.14 9/20	.00 1/10
Copper, Lake, lb.	.14½	.14⅝	.14⅝	.14⅝	.14⅝	.14⅝	+ .00⅛
Cottonseed Oil, bbl.	7.14	7.14	7.10	7.05	7.08	7.00	— .14
Cyanide Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	4.07½	4.07½	4.07½	4.07½	4.07½	4.07½	.....
Linseed Oil	.52	.52	.52	.52	.52	.52	.....
Open-Hearth Steel, ton	19.00	19.00	19.00	19.00	19.00	19.00	.....
Petroleum, Kansas Crude, bbl.	1.03	1.03	1.03	1.03	1.03	1.03	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.62	.62	.62	.62	.63	.63	+ .01
Rubber, Fine Up-River, Para	.74	.75	.75	.75	.75	.76	+ .02
Silk, raw Italy	....	....	....	....	5.15	5.15	.....
Silk, raw Japan	....	....	....	....	4.18	4.20	.....
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	37.95	38.85	38.84	38.88	38.90	39.20	+1.25
Tire Scrap	.04½	.04½	.04½	.04½	.04½	.04½	.....

November Exports Are $2,335,039

Figures Show Gain of $165,000 Over 1912 —Shipment of Trucks Increased to $105,501

NEW YORK CITY, Jan. 27—The November export statistics show a gain in cars and parts of $165,000 over last year. The total value of automobiles and parts in 1913 was $2,335,039 while that of 1912 was $2,107,721. The imports of cars decreased sharply but the parts gained more than 200 per cent. The shipment of commercial cars increased from $56,176 in 1912 to $105,501 in 1913 at a gain of fully 100 per cent. The average value of passenger vehicles decreased from $1,750,890 in 1912 to $1,676,726 in 1913. Last year's exports were to seventy-five countries and colonies. America's largest customer is Canada, shipments in the 11 months being 5,824 valued at $7,870,086. The United Kingdom is the next best customer with 4,504 valued at $3,482,301.

Moskovics Joins Marmon Organization

INDIANAPOLIS, IND., Jan. 26—F. E. Moskovics, well known in the automobile industry, has recently joined the organization of the Nordyke & Marmon Co., Indianapolis, Ind.

100 Case Branch Managers Meet

RACINE, WIS., Jan. 24—Nearly 100 branch house managers from all over the world gathered at the main works of the J. I. Case T. M. Co., at Racine last week for the biennial convention, inspection of works and school of instruction which the company conducts for its American managers and salesmen once each year and for the foreign managers every 2 years. Managers came from South America, Russia, Asia, Canada, Africa and other countries. The Case sales organization is one of the largest in the world, consisting of seventy-nine branch houses and 9,000 dealers. All the delegates expressed themselves as well pleased with the condition of the motor car market and increased allotments of Case cars were demanded all along the line. The foreign managers were particularly enthusiastic.

Ford Not To Build Cyclecar

DETROIT, MICH., Jan. 28—*Special Telegram*—Because Henry Ford has been driving on the Detroit streets in a miniature car of the cyclecar type which bore many earmarks of Ford design the report has become widespread that he was going to build such a car to sell for $350. This rumor is absolutely denied from the offices of the Ford company.

Bosch Reduces Prices on Plugs and Magnetos

NEW YORK CITY, Jan. 28—The Bosch Magneto Co. has made a general reduction on its plugs and magnetos. Its plugs may now be bought at the rate of $0.65 each in a single lot of 100. One plug will cost $1.00. In the 500 lot, they will cost $0.58 each. The ZR Four Independent model magneto has been reduced from $96 to $81 and the magneto used on the Ford, called the DU Four Independent, has been reduced from $60 to $50.

Anglada Will Manufacture Liberty Cyclecar

NEW YORK CITY, Jan. 26—J. A. Anglada, of this city, has organized the Liberty Motor Co., and is arranging a production schedule for his new Liberty cyclecar. Associated in the company of which Anglada is president, are C. S. Ackley, of the McKiernan Terry Drill Co., N. Y. City, who is secretary, and A. W. Drake, a coal operator of Hazelton, Pa., who was formerly head of the Harward Electric Co., who is treasurer. A factory will be established, pending which an original lot of 200 cars will be produced in this city. The car, which is to sell for $375, is built to seat two passengers side by side. It has a 92-inch wheelbase and 42-inch tread, and is designed on streamline principles.

DAVENPORT, IA., Jan. 28—F. W. Skinner, secretary of the Zip Cyclecar Co., Davenport, Ia., has sold his interests to his associates, G. D. French and R. W. Phelps. Mr. Skinner has severed active connection with the company, but his future plans have not been announced.

DETROIT, MICH., Jan. 28—Moore Kelly has been appointed Detroit manager for Byrne, Kingston & Co., and the Kokomo Electric Co., effective February 1. Mr. Kelly has been associated with several companies manufacturing automobile parts.

EXPORTS OF AUTOMOBILES AND PARTS FROM THE UNITED STATES FOR NOVEMBER, 1913, AND COMPARISON WITH PREVIOUS YEARS

	November—				Eleven Months Ending November—					
	1912		1913		1911		1912		1913	
EXPORTED TO:	Quantities	Values	Quantities	Values	Quantities	Values	Quantities	Values	Quantities	Values
Automobiles					13,560	$13,990,931	13,860	$13,715,535		
Commercial	31	$56,176	64	$105,501			288	524,754	921	$1,586,147
Passenger	1,658	1,750,890	1,707	1,676,726			7,559	7,402,888	23,579	23,291,160
France	83	62,727	87	63,641	385	425,714	668	502,040	801	609,731
Germany	46	32,197	69	35,827	106	118,710	438	348,398	959	811,293
Italy	13	16,279	25	17,899	171	194,784	267	240,715	302	259,079
United Kingdom	164	139,222	321	297,771	3,173	2,741,524	4,371	3,302,918	4,504	3,482,301
Other Europe	99	80,086	121	80,246	705	650,642	1,439	1,178,847	1,686	1,435,495
Canada	471	550,362	266	396,753	4,556	5,137,685	6,864	8,255,134	5,824	7,870,086
Mexico	35	51,494	14	24,161	262	432,316	233	372,086	213	386,894
West Indies and Bermuda	43	48,114	50	48,058	263	303,434	316	331,230	455	445,596
South America	273	346,995	203	218,930	909	1,131,182	1,859	2,164,983	2,474	2,773,140
British Oceania	263	265,820	295	269,941	2,041	1,871,716	3,112	2,852,005	3,009	2,855,330
Asia and other Oceania	148	154,035	229	244,120	742	719,083	1,469	1,464,358	2,230	2,218,897
Other countries	51	59,735	91	84,880	247	264,141	671	630,463	1,983	1,729,465
Total No.	1,689	1,807,066	1,771	1,782,227	13,560	13,990,931	21,707	21,643,177	24,500	24,877,307
Parts of (not including engines and tires)		300,655		552,812		2,951,188		4,236,765		5,730,074
Total automobiles, and parts of		2,107,721		2,335,039		16,942,119		25,879,942		30,607,381
Automobile engines No.	480	92,719	99	43,497	1,246	146,573	8,175	1,036,532	8,478	1,481,801

IMPORTS OF AUTOMOBILES AND PARTS TO THE UNITED STATES FOR NOVEMBER, 1913, AND COMPARISON WITH PREVIOUS YEARS

IMPORTED FROM:										
France	42	$108,356	16	$40,708	294	$661,956	426	$1,022,995	174	$410,980
Germany	11	28,206	2	5,200	147	322,153	56	133,337	80	211,131
Italy	19	25,952	6	6,426	118	182,085	99	155,503	80	143,799
United Kingdom	7	17,670	6	15,684	150	352,683	122	296,253	48	144,677
Other countries	8	18,167	7	9,755	160	352,537	78	163,847	72	150,631
Total	87	198,351	37	77,773	869	1,871,414	781	1,771,935	454	1,061,218
Parts of (except tires)		21,863		67,420		297,442		263,125		309,451
Total automobiles and parts of		220,214		145,193		2,168,856		2,035,060		1,370,669

Europe's First 1915 Show at Berlin

Europe's New Models To Appear at International Exhibition Next October

PARIS, Jan. 16—Europe's 1915 models will make their first appearance before the public at an international exhibition to be held in Berlin during the first week of October, 1914. After being absent from the show field for three years, largely owing to the lack of a suitable hall, the German manufacturers have decided to jump in ahead of neighboring countries and hold their show as early as possible in October. The exact date has not yet been fixed.

A new exhibition hall is now being erected in Berlin for the automobile show. It is a building having a floor area of 172,000 square feet, no galleries, and a lighting scheme which will give equal value to all exhibitors.

London will open its show at Olympia on Friday, November 6, this date being selected so as to allow the necessary time for the shipment of the Paris exhibits to England. It is by reason of an agreement arrived at by the International Union of Automobile Manufacturers that the four great European shows can follow at brief intervals, but of sufficient length, however, for the same cars to serve for all the shows. It is with this object in view that the Brussels show, which has hitherto been held in January, will take place in December within a fortnight of the closing of the Olympia hall.

Tour de France Has 37 Entrants

PARIS, Jan. 17—Thirty-seven cars are enrolled in the annual Tour de France reliability test to begin at Paris on March 1. Any machine of not more than 183 cubic inches cylinder area can take part in the test, but practically half are considerably below this limit, several of them having motors of 2.5 by 3.9 inches bore and stroke. Unlike previous trials, the runs will alternate with hill climbs and speed trials in the neighborhood of the various headquarters towns, thus giving provincials an opportunity of examining the cars and judging their capabilities on the open road and on hills. The main feature of the tour is a reliability run of 2,000 miles during which an average speed of 19 miles an hour must be maintained under penalty of disqualification. Towards the end of the trip there will be a 60 miles speed test over the course at Le Mans used last year for the Grand Prix de France big car race.

France to Have 2,000-Mile Run

PARIS, Jan. 17.—February 15 will see the opening of the French competition season, when the twenty-one competitors in the Coupé de Tourisme endurance test will be sent on their 2,000 miles trip round France with gasoline and oil tanks sealed and the number of tires counted and tabbed. The event is open to small light cars and cyclecars only, the maximum cylinder area being 122 cubic inches. Half the cars entered do not exceed 100 cubic inches, yet they will tackle Alpine passes and Pyrenean gradients with the equivalent of four passengers aboard. England and France are the countries represented in the event, the makes of cars being Humberette, Humber, Auto Carriers, Ruby, Violet-Bogey, Autorette, Jouve & De Girac, Automobilette, Scap, Ponette, Schneider, Scar, Jou, Suere and Luxior. Leaving Paris on February 15, the competitors will return to that town on February 25.

Brussels to Test Lighting Systems

BRUSSELS, BELGIUM, Jan. 15—Belgium is interested in lighting systems and has decided to hold a public competition on February 9, 10 and 11. Three types are provided for: electrical, acetylene and miscellaneous, and in each a maximum of 300 points can be obtained under the following headings: 100 points for power of the lamps, this being tested by directing the rays on a board having letters of varying dimensions, 5 points for regularity of operation and ease with which repairs can be carried out; 50 points for simplicity of utilization; 25 points for ease of maintenance and general accessibility; 25 points for elegance, minimum weight and displacement; 50 points in inverse ratio to the catalogue price.

Each car must carry a complete set of lamps: two headlights, two side lights, tail light, and roof light. The price of the individual units must be made known before the competition. Separate awards will be made in each class. The competition is under the control of the Technical Committee of the Belgium Automobile Association.

Big Races Will Start at 10 A. M.

NEW YORK CITY, Jan. 26—The Vanderbilt Cup race at Santa Monica will start at 10 a. m., sharp, February 21 and should be finished before 2 p. m. The International Grand Prize race will start at 10 a. m. sharp on February 23 and should be finished by 3.30 p. m.

One big grandstand will be built on the Ocean Front, as has been the case in past races there. The original intention of erecting a series of grandstands across the course and have the racing cars rung beneath the stands, has been abandoned for this year on account of lack of time.

The entries for the Vanderbilt Cup and Grand Prize races were opened at noon, January 20 and at this date stand as follows:

Car	Driver	Entrant
Stutz	Earl Cooper	Walter M. Brown Co.
Delage	Omar Toft	Leotia K. Northam, Inc.
Mercer	Spencer Wishart	Mercer Automobile Co.
Mercer	Edwin Pullen	Mercer Automobile Co.
Mercer	Barney Oldfield	Geo. F. Settle.

The above cars are entered for both races.

The Savage Tire Co. has entered its 120-horsepower Fiat in the Grand Prize race, nominating Teddy Tetzlaff as driver.

The Vanderbilt Cup race will consist of thirty-five laps of the famous Santa Monica course, which is 8.401 miles in circumference, making a total of 294.035 miles. The International Grand Prize race will consist of forty-eight laps of the course, making a total distance of 403.248 miles.

De Palma Resigns from Mercer Team

CHICAGO, ILL., Jan. 26—Fred J. Wagner, appointed as starter of the Vanderbilt and Grand Prize road races that are to be run at Santa Monica, Cal., and who also is soliciting entries for these classics, announces that Ralph de Palma has resigned from the Mercer squad because of his objection to teaming it with Barney Oldfield, who with Spencer Wishart, is nominated for the Californian event. Ed Pullen will take de Palma's place.

De Palma now is figuring on again forming an alliance with E. J. Schroeder, owner of the Mercedes. De Palma drove in the 1912 race at Indianapolis in which he also won the Vanderbilt and the Elgin National. He also is in receipt of a cablegram from the Mercedes company of Germany, announcing it will have a factory entry in this year's Indianapolis race and wants de Palma to drive it. A second Mercedes will be in the classic with Pilette as its pilot. This will be entered by E. C. Patterson.

Wagner also announced that Harry Grant will drive W. Ziegler's Isotta in the coast events, while Ziegler's recently acquired English Sunbeam will be piloted by J. B. Marquis, at one time Lewis Strang's mechanic. Mulford will be unable to drive the Peugeot because of a recent accident to the car on the Long Island Parkway, although there is a slim chance of his being able to fix it up in time.

The Californians have notified Wagner that Mrs. Leota Northam, of Los Angeles, who has entered a Simplex, also has nominated a French Delage, a new car she has just purchased. She sent her chauffeur to Europe to buy the car and he has cabled he has made the purchase.

Guyot Will Drive Delage at Indianapolis

PARIS, Jan. 17—Albert Guyot, who handled a Sunbeam last year in the Indianapolis 500 mile race, is about to make an official entry in the event next May with the Delage 120 horsepower racer driven by him in the last French Grand Prix. Guyot finished second with this car in the Le Mans race last fall, and a companion car established the world's long distance road record with an average of 76.8 for the full distance and 82.5 for a lap. There is a possibility of a second Delage entry being made, the car to be driven by Rene Thomas, who has been successively on the teams of the Peugeot and Delage companies.

COLUMBUS, O., Jan. 24—State Registrar of Automobiles, J. A. Shearer, has laid off nearly all of his office force because of the injunction which has tied up the department in Ohio. Only one deputy is on duty in the place of several dozen working at this time last year. All of the remittances received for 1914 tags have been sent back to the owners.

Banquet of Federal Truck Co.'s dealers at the Cadillac Hotel, Detroit, at which a dealers' association was formed

Tire Abuse—Subject at Record Truck Club Meeting

Federal Truck Men Hold Convention—Trucks May Supplant Freight Trains—Drednot Truck to Reorganize

NEW YORK CITY, Jan. 22—The January meeting of the Motor Truck Club, held last night in the new service station of the Locomobile Co., drew an attendance of 107, one of the largest crowds ever recorded at a regular meeting. About forty truck owners attended the meeting.

S. V. Norton was the speaker of the evening, his paper being on tires with illustrations. Mr. Norton, who is truck tire sales manager of the B. F. Goodrich Co., Akron, O., illustrated his lecture with lantern slides showing the history of a pneumatic tire from the time the Brazilian Indian taps the rubber tree until the tire is completed. A second set showed the causes and effects of solid tire abuse. In explaining the effect upon tires of overloading them, Mr. Norton explained that the elasticity of rubber was both of extension and compression. Just as rubber will break if stretched too far, so it will if compressed. The slide illustrating this point showed a tire which had been so broken down at the base, but whose tread was good for several thousand miles, which, because of one case of overloading, had to be discarded.

In a similar manner it was shown how overspeeding deteriorates the tire by heat and increased friction, and by intensification of impact negotiating obstructions. The effect of bad roads, skidding and misalignment of wheels followed.

Mr. Norton next covered the question of special bodies as they affect tires. He stated that it was of great importance that in fitting a special body to a truck without the supervision of the truck manufacturer, that the standard specifications of the manufacturer, upon which tire sizes are determined, be observed as to overhang, weight and capacity. He strongly endorsed the bonus system for drivers as practiced successfully abroad, and advocated its discussion and encouragement by American truck users and associations. He stated that the mechanical condition of the truck and the skill of the driver cannot be better than the state of the tires, provided, of course, that they are of good quality.

Mr. Slade discussed the effect of steel wheels upon tire wear. He stated that metal-base tires of either the pressed-on or quick detachable type were preferable to other types for commercial work. Mr. Norton stated that the conditions that governed the choice between steel and wood wheels were heat, rigidity and permanence. He also admitted that single tires were superior from a standpoint of mileage to the dual type.

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Federal Truck Men Hold Convention

DETROIT, MICH., Jan. 23—The concluding event of a very successful 3-day convention of the dealers of the Federal Motor Truck Co. at the factory here was an elaborate banquet at the Cadillac Hotel which was tendered to the fifty visitors. The guests represented territory which covers practically all sections of the country, some coming from California and others hailing from Eastern and Southern sections.

The feature of the banquet from the business point of view was the formation of the National Federal Dealers' Association which has for its objects the knitting closer together of the dealers of the Federal Company, to foster the spirit of cooperation and to devise ways and means of giving even greater service to truck owners.

The officers elected to head this organization, which is unique in the truck selling field, are Allen Baker, St. Louis, president; W. L. Hughson, San Francisco, vice-president; C. T. Chenevert, Detroit, secretary; and H. S. Dunlavy, Chicago, treasurer. C. K. Thomas, New York was made chairman of the Eastern Zone committee of this organization. Mr. Thomas is the promulgator of the new sales organization plan.

Kirk B. Alexander livened up the affair with the presentation of a one-act play entitled "Pass It Along." The author gave this the sub-title of "A Realistic Melodrama of the Motor Truck Business in One Frankly Frightful Act."

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Trucks May Supplant Freight Trains

WASHINGTON, D. C., Jan. 27—*Special Telegram*—Motor trucks will be used in many sections to supplant freight trains if the proposed rate increase goes into effect according to testimony given at the Interstate Commerce Commission rate hearing here today. Joseph Horner, treasurer of the Consumers Ice Co., Grand Rapids, Mich., said that if the present rate of 40 cents per 100 pounds between his ice house at Ramona Park and Grand Rapids is increased to 45 cents, as proposed, he will establish a a line of motor trucks between the two points.

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Drednot Truck to Reorganize

MONTREAL, QUE., Jan. 26—Drednot Motor Trucks, Ltd., of Montreal, is to be reorganized. The new place of business will be at 143 Wellington street. The truck to be made by the new company will be as before called Drednot. There are now a number of these trucks in use in Montreal, also at Joliette and Sherbrooke.

The practical part of the business will be under the control of Vibert S. Ross, an experienced automobile and motor truck engineer.

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BOSTON, MASS., Jan. 28—Announcement has been made by the Thomas B. Jeffery Co., of the appointment of C. P. Rockwell, Inc., as representative for the Jeffery cars in New England and of the Jeffery Sales Co. as representatives for Philadelphia.

Boston to Have Over 80 Passenger Car Exhibitors

Space for Both Passenger and Truck Shows Nearly All Taken

BOSTON, MASS., Jan. 26—Active preparations are under way for the two shows in Boston, the first to be for pleasure cars and the other for trucks. Manager Chester I. Campbell has allotted all the space for the two main floors, and all the basement. There will be but one car exhibit in the balcony, the rule against putting cars there having been suspended in order that one well-known make could get space other than in the basement. There will be a greater variety of accessory exhibits than last year. The action of the accessory association in putting the ban on Boston has not had any effect except to keep out some of the firms that make radiators, axles, ball bearings, etc. As for shock absorbers, speedometers, tops, and other such things there will be plenty of them shown. In many instances they will be exhibited by dealers of accessories so that the makers or the accessory association will have nothing to do about it. All the space previously allotted to accessories has been taken, so that it shows the vote of the association was no handicap. There will be more than eighty car makers represented, according to the officials.

The truck show will open on the Tuesday evening following the close of the pleasure car show. The pleasure cars will have from March 7 to 14 and the trucks from March 17 to 21 so the two shows will be within 2 weeks. Already the entire space in both Grand and Machinery halls has been taken for the trucks, and some of the basement space. Many makers that are not now represented in Boston will exhibit in the show, seeking agencies.

Sixty-two makers or agents are represented in the first section of the show embracing 356 cars on exhibition, valued at $530,000, the lowest priced car being $650, the most expensive, $9,500. While two motor shows were put on last year, this year's show equals, if not surpasses the larger of the two, as regards the number of exhibits.

Detroit Show Attendance 47,186

DETROIT, MICH., Jan. 26—Saturday evening, January 24, brought to a close the thirteenth annual Detroit automobile show. This show, which was held in the new branch factory building of the Ford Motor Co., set several records of note, and was in every way a success. The new location was a daring move for it was just 3 miles from the city hall while all of these shows in the past have been within the half-mile circle. The paid attendance, as given out today by Mr. Starkweather, treasurer of the D. A. D. A., counted up to 47,186. This was an increase of about 22 per cent. over the figures for the 1913 exhibit.

Montreal Has 2-Weeks Show

MONTREAL, QUE., Jan. 23—The Montreal automobile show this year is extending over a period of 2 weeks the first week, January 24 to 31, being devoted to the display of pleasure cars and the week following to commercial vehicles. The show this year is held under the auspices of the Montreal Automobile Trade Association which is composed of the leading dealers of this city. All local firms are looking forward to a heavy increase in business as compared with 1913.

An elaborate scheme of decoration consisting of palms, fountains and bunting forms an attractive setting for the various display of cars.

Rochester Show Opened

ROCHESTER, N. Y., Jan. 26—Mayor Hiram H. Edgerton of Rochester officially opened at 8 o'clock Saturday night Rochester's 6th annual automobile show. The exhibition is being held in the three buildings of Exposition Park. For the decorations a simple scheme of bunting was used and lights that were attractive and in keeping with the dignity of the show. Buildings one and two contain the automobiles and the accessories and motorcycles are housed in the third building. The show will continue until Saturday night.

Washington Show Closes with Good Business

WASHINGTON, D. C., Jan. 24—When the motor car show of the Washington Automobile Dealers' Assn. closed in Convention Hall tonight the exhibitors to a man expressed themselves as being more than pleased with the amount of business done during the week. Not only were the crowds greater at this show than at any previous one here, but the number of sales made exceeded those of any previous show. It is the belief of all those who took part in the show that it will give the business a decided impetus.

By Way of Correction

MONTREAL, QUE., Jan. 26—The statement which appeared in THE AUTOMOBILE of January 22, to the effect that the Maritime M. C. Co., Ltd., of St. John, N. B., had been absorbed by a newly organized company called the Dominion M. C. Co., is an error. This company has established agencies and branches throughout Canada for the sale of Palmer-Singer cars, the Canadian models being known as Maritime Singers. This firm has no connection whatever with the Dominion M. C. Co.

Pittsburgh Packard Drivers Dine

PITTSBURGH, PA., Jan. 21—The first annual banquet of the Packard Drivers' Association was held last night in the Rittenhouse with about seventy members present. The honor guests were W. N. Murray and F. E. Payne of the Packard Motor Car Company of Pittsburgh, both of whom made short addresses. The toastmaster was H. C. Hoop, retiring president, and a large number of members made short addresses. The function was a distinct success.

First annual banquet of the Packard Drivers' Association at the Rittenhouse, Pittsburgh, Pa.

MAY Build Ford Plant in Johnstown—It has been learned from good authority that the Ford Motor Co., Detroit, Mich., is looking towards Johnstown, Pa., as a place to locate an auxiliary plant and representatives of the company have been on the ground making inquiries as to available sites and other data. The Cambria Steel Co., located in this city, produces many of the steel parts used in Ford cars and with the raw material, fuel and transportation facilities at its very doors, it is said, that the representatives have been much impressed with the advantages offered for the auxiliary plant.

Air Friction Carburetor Increases—The Air Friction Carburetor Co., Dayton, O., will erect a plant of its own some time during the present year.

Sheboygan Gets Inner-Liner Plant—The Lion Liner Co., Appleton, Wis., manufacturing inner-liners and other tire specialties, has moved its factory and general offices to Sheboygan, where the floor space is more than doubled.

Moore Leases New Plant—The Moore Motor Truck Co., Philadelphia, Pa., has leased the property of the Cement Products Co., South Wilmington, Del., and will establish a plant. An addition, 60 by 200 feet, will be erected.

Ford Plant in Atlanta—An assembling plant, to be built by the Ford Motor Co., Detroit, Mich., will be erected in Atlanta, Ga., according to reports. It will be six stories high, reinforced concrete, 140 by 300 feet, annual assembling capacity 12,000 to 15,000 automobiles, and with its offices at 311-380 Peachtree street.

May Sell Sandusky Plant—Application will soon be made in the bankruptcy court at Sandusky, O., for the sale of the entire property of the Sandusky Auto Parts and Truck Co., a concern that employed 300 men before shutting down several months ago. The failure of the Michigan Buggy Co., it is said, forced the company to close.

Trumbull Cyclecar's Bridgeport Factory.—A plant is being erected for the American Cyclecar Co., Bridgeport, Conn. This company manufactures the Trumbull cyclecar. The building will be 50 by 150 feet, four stories, of brick, slow-burning construction. Between 300 and 400 hands will be employed. The capital stock of the corporation has been increased from $25,000 to $200,000.

Canadian Ford First Convention.—The first annual convention of the Canadian branch managers of the Ford Motor Co. of Canada, Ford, Ont., was held recently at the factory. The party was entertained at the Detroit factory by moving pictures of factory operations made by the Ford moving picture operator. The party also inspected the new additions at the Detroit and Canadian factories.

Kissel Resumes Operations—The main works of the Kissel Motor Car Co. at Hartford, Wis., have resumed operations with a full complement of men after a shut-down of two weeks for inventory and overhauling. The Hartford works are engaged in the production of two new Kissel models, a light six and a small four, the details of which are about to be announced. The shut-down at the holiday period took the place of the usual mid-summer vacation, which last year was eliminated because of the pressure of business.

Milwaukee Plant Resumes Work—The former plant of the Milwaukee Motor Co., Milwaukee, Wis., has resumed operations under the management and ownership of Harris Bros., Chicago, Ill., owners of the Chicago House Wrecking Co. The plant has been idle since the middle of June, when the company went into bankruptcy. The Harris interests bid in the plant for $86,000 and intend to rehabilitate the property as a going concern. As soon as it arrives at a profit-making condition it will be disposed of. About 125 men are employed at this time and the line of products is practically identical with the output of the bankrupt Milwaukee Motor Co.

The Automobile Calendar—Shows, Meetings, Etc.

Jan. 24-31	Montreal, Que., Automobile Show, Passenger Cars, Montreal Automobile Trade Assn.
Jan. 24-31	Rochester, N. Y., Automobile Show, Exposition Park, Rochester Automobile Dealers' Assn.
Jan. 24-31	Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 26-31	Scranton, Pa., Automobile Show, Automobile Assn. of Scranton.
Jan. 27-31	Portland, Ore., Automobile Show, Armory, Portland Auto Trade Assn.
Jan. 31-Feb. 7	Minneapolis, Minn., Automobile Show.
Feb.	Hartford, Conn., Show.
Feb.	St. Louis, Mo., Show.
Feb. 2-7	Buffalo, N. Y., Automobile Show, Buffalo Automobile Dealers' Assn.
Feb. 3-7	Kalamazoo, Mich., Show.
Feb. 3-7	Montreal, Que., Motor Truck Show, Montreal Automobile Trade Assn.
Feb. 4-7	St. Joseph, Mo., Annual Show, St. Joseph Auditorium, St. Joseph Automobile Show Assn.
Feb. 9-14	Seattle, Wash., Annual Automobile Show, State Armory Bldg., W. I. Fitzgerald, Manager.
Feb. 9-14	Buffalo, N. Y., Truck Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Grand Rapids, Mich., Fifth Annual Western Michigan Show, Klingman Furniture Exposition Bldg., *Grand Rapids Herald.*
Feb. 9-14	Buffalo, N. Y., Commercial Car Show, Buffalo Automobile Dealers' Assn.
Feb. 9-14	Portland, Me., Second Annual Show, Dealers' Assn.
Feb. 11-14	Geneva, N. Y., Automobile Show, State Armory.
Feb. 11-14	Louisville, Ky., Show, First Reg. Armory, Dealers' Assn.
Feb. 14-21	Pittsburgh, Pa., Automobile Show, Pittsburgh Auto Show Assn.
Feb. 16-22	Kansas City, Mo., Auto Show.
Feb. 16-21	Toronto, Ont., Automobile Show, E. M. Wilcox.
Feb. 17-21	Salt Lake City, Utah, Automobile Show, W. D. Rishel.
Feb. 18-21	Bloomington, Ill., Automobile Show, McLean County Automobile Club.
Feb. 18-21	Albany, N. Y., Passenger Car Annual Show, State Armory, Albany Auto Dealers' Assn.
Feb. 21	Santa Monica, Cal., Vanderbilt Cup Race.
Feb. 21-28	Newark, N. J., Automobile Show, N. J. Auto Trade Assn.
Feb. 21-28	Cincinnati, O., Automobile Show, Cincinnati Automobile Dealers' Assn.
Feb. 23	Santa Monica, Cal., American Grand Prix.
Feb. 23-25	Albany, N. Y., Commercial Show.
Feb. 23-28	Indianapolis, Ind., Auto Show, Indianapolis Auto Trade Assn.
Feb. 23-28	Omaha, Neb., Automobile Show, Omaha Automobile Assn.
Feb. 24-28	Syracuse, N. Y., Automobile Show, State Armory, Syracuse Automobile Dealers' Assn.
Mar. 2-4	Cincinnati, O., Commercial Vehicle Show, Cincinnati Automobile Dealers' Assn.
Mar. 2-7	Sioux City, Ia., Show, New Auditorium Bldg., Sioux City Auto Club Assn.
March 2-7	Utica, N. Y., Show, Automobile Club, W. G. Comstock, Mgr.
Mar. 3-7	Fort Dodge, Ia., Show, Fort Dodge Auto Dealers' Assn.
	Tiffin, O., Show, *Tiffin Advertiser.*
Mar. 7-14	Hamilton, Ont., Passenger and Truck Show.
Mar. 7-14	Boston, Mass., Automobile Show.
Mar. 9-14	Des Moines, Ia., Show, Des Moines Automobile Dealers' Assn.
Mar. 17-21	Boston, Mass., Truck Show.
Apr. 9-15	Manchester, N. H., Automobile Show.
May 30	Indianapolis, Ind., 500-mile Race, Indianapolis Motor Speedway.
July 3-4	Tacoma, Wash., Road Races, Tacoma Carnival Assn.
July 4	Sioux City, Iowa, 300 Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 28-29	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.

The Week in the Industry

Motor Men in New Roles

RIDLEY Heads Firestone's Newark Branch—The Firestone Tire & Rubber Co., New York City, will open a branch and service station in Newark, N. J., at 84 and 91 Bank street. J. S. Ridley, who has been office manager of the N. Y. branch, will be manager of the Newark branch. A. C. Galbraith, also connected with the company, will make his headquarters in Newark, his territory being in New Jersey.

Hewitt Resigns from Premier—H. B. Hewitt, treasurer and purchasing agent of the Premier Motor Mfg. Co., Indianapolis, Ind., has resigned.

Wallace Joins Van Harlingen—Samuel Wallace, Jr., a traffic engineer, has joined the engineering forces of J. M. Van Harlingen of New York City.

Bleasdale Detroit Regal Manager—C. G. Bleasdale, of Cleveland, O., has been appointed manager of the Detroit, Mich., retail branch of the Regal M. C. Co.

Berrien Batavia Rubber Sales Manager—E. P. Berrien has been appointed sales manager of the Batavia Rubber Co., Batavia, N. Y., a tire making concern.

Myers Resigns from Swinehart—C. B. Myers has resigned as general manager of the Swinehart Tire & Rubber Co., Akron, O., and will take a brief vacation.

Willys Takes Rest in Cal.—J. N. Willys, president of the Willys-Overland Co., Toledo, O., will leave on February 10 for California for a period of rest and recreation.

Pelletier Lozier Counselor—E. Le Roy Pelletier has become advertising counselor for the Lozier Motor Co., Detroit, Mich. He will continue to direct the Maxwell Motor Co. advertising.

Strorbridge Makes Y. M. C. A. Speech—George Strorbridge, chief examiner of the automobile bureau of the Secretary of State, will speak on Thursday, Jan. 29, at the West Side Y. M. C. A. on "What the State Expects of the Chauffeur."

Edge Promoted by Locomobile—H. H. Edge, who for the past 2 years has been superintendent of the Locomobile factory at Bridgeport, Conn., has been promoted to the position of factory manager. He succeeds E. F. Russell, who recently resigned.

George M. Davis a Benedict—George M. Davis, who was advertising manager for the Pierce-Arrow M. C. Co., Buffalo, N. Y., and now is connected with the Packard agency in Albany, was married recently to Miss S. L. Callahan of Buffalo. They will live in Albany.

Ilg with Wichita Falls Co.—W. H. Ilg, formerly sales and advertising manager of the Schacht M. C. Co., Cincinnati, O., has taken a similar position with the Wichita Falls Motor Co., Wichita Falls, Tex. This company is building motor trucks for the West and Southwest trade.

Ford Olds Sales Manager—D. E. Ford, who was formerly manager of the Denver, Col., branch of the Bond Motor Co., dealer in the Oldsmobile, and who for the past year has been special representative for the Oldsmobile, succeeds W. P. Morris as sales manager for that territory.

Lilly Manager Cadillac Oil Co.—The Cadillac Oil Co. has opened offices at 25 William street, New York City, with W. H. Lilly as general manager. This company proposes to furnish sub-dealers of the Detroit Cadillac M. C. Co. of New York with a class of lubricants especially adapted for this car.

Alvin Sears-Cross Sales Manager—F. J. Alvin has been appointed general sales manager of the Sears-Cross Co., manufacturer of the speedometer of that name. The general offices of the company will be moved from New York to Detroit. W. Burdick will remain in charge of the Detroit end as representative to manufacturers.

Mansbach Back from Europe—Louis Mansbach, treasurer of the Times Square Automobile Co., New York and Chicago, has returned from a visit to the different automobile centers of Europe. He established a number of agencies for The Times Square company, and anticipates that the export business in automobiles will increase each year.

Radford Designing Light Car—W. H. Radford, former consulting engineer and factory manager of the Warren M. C. Co., Detroit, Mich., has opened an office at 500 Moffat Bldg., that city, and is working on designs for a light car of low price. As soon as the experimental models are completed, the car will be backed by a large amount of capital, and the manufacture will be extensive.

Garage and Dealers' Field

NEW Eisemann Service Stations—The Eisemann Magneto Co., Brooklyn, N. Y., has opened the following service stations: Philadelphia Magneto Repair Co., Philadelphia, Pa.; Storage Battery Service Co., Seattle, Wash.; Bissingers Magneto Exchange, Cleveland, O.; McCarthy Bros. & Ford, Buffalo, N. Y.; Auto Supply Co., Memphis, Tenn.; Charles Rubel & Co., Washington, D. C.; H. G. Zimmerman, Harrisburg, Pa.; P. Melchoirs Machine Works, Omaha, Neb., and the Archer-Wiggins Co., Portland, Ore.

Des Moines' Municipal Garage—Des Moines, Ia., is to have a municipal garage. By April 1 the department of public safety will have thirty-five automobiles and motorcycles.

Pathfinder Agent Moves—The Western Motor Co., Kansas City, Mo., agent for the Pathfinder and Empire cars, has moved into new quarters at 1702 Grand avenue.

Mechanical Rubber's Factory Branch—The Mechanical Rubber Co., Cleveland, O., has opened a factory branch at Detroit, Mich., 228 Jefferson avenue, East.

Secures New Departure's N. Y. Agency—Pruyn & Bilodeau, 1876 Broadway, N. Y. City, have secured the agency for the American-made New Departure ball bearing.

Braender Tires on Stutz and Mercer—The Stutz crew of racing cars, as well as the Mercer, will use Braender tires again for the forthcoming race to be held at Santa Monica, February 21-23.

New Invader Oil Agents—The James Bailey Co., Portland, Me., and George Collins, Boston, Mass., will handle the product of the Invader Oil Co., New York City. The former will cover the whole state of Maine on an exclusive selling basis for 1914.

Jackson Builds in Kansas City—Contracts were let recently for the construction of a new two-story brick and stone building at 1727 McGee street, Kansas City, Mo., for the Jackson Automobile Co. A foundation heavy enough to support four additional stores will be built.

Lawter Tractor Will Move—The Lawter Tractor Co., Newcastle, Ind., has arranged to remove its plant to St. Marys, O. It will occupy the plant occupied formerly by the Heiser Co., which recently went into the hands of a receiver. The company manufactures agricultural and power machinery.

New McGraw Tire Factory Branch—A factory branch of the McGraw Tire and Rubber Co., East Palestine, O., will be located in Kansas City, Mo., in the near future. Officials of the parent company are in Kansas City seeking permanent quarters to be used as a distributing and sales warehouse for the Southwest trade.

New 25-Passenger Cars for Line—Four 25-passenger automobile bodies, built along the general lines of an interurban car, are in the course of construction in Seattle, Wash., for the Tacoma Transit Co., which will operate the quartet of cars between Tacoma and towns in the Puyallup Valley. One special feature of these bodies is that there will be only one door, which will be operated by the driver, and which can be opened only when the machine is at a standstill.

Schenectady's Bridge on Main N. Y. Highway—The City of Schenectady, N. Y., is projecting a bridge from the foot of State street to the Village of Scotia. This is on the main state highway between N. Y. and Buffalo and will be a direct and logical course as compared with the present dangerous, devious route over the Mohawk River. The projectors of this bridge are going before the legislature to ask for a $900,000 appropriation for this work in the city, and town.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

AMSTERDAM, N. Y.—Merriam Motor Car Co.; capital, $15,000. Incorporators: Walter J. Merriam, John Bartholomew, Harry S. Benjamin.

APPLETON, WIS.—Frint Motor Car Co.; capital, $5,000; to deal in motor cars and accessories. Incorporators: Leslie D. Frint, H. F. Heckert, S. C. Shannon.

ARCADE, N. Y.—Arcade Motor Car Co.; capital, $15,000; to deal in motor vehicles. Incorporators: K. R. Wilson, Frank R. Wilson, Anna H. Wilson.

AUGUSTA, ME.—Arrow Cycle Car Co.; capital, $50,000; to manufacture automobiles, motor vehicles, cyclecars, trucks, etc. Incorporators: R. S. Buzzell, L. J. Coleman.

BALTIMORE, MD.—Empire Motor Co.; capital, $100,000; to manufacture engines, automobiles, etc. Incorporators: E. V. Webster, Geo. G. Schroeder, Chas. G. Guyer.

BAY CITY, TEX.—Bay City Auto & Sales Co.; capital, $7,500. Incorporators: M. Thompson, F. A. Thompson, W. D. James.

BIRMINGHAM, ALA.—Saunders Motor Car Co.; capital, $5,000. Incorporators: B. J. Saunders, C. L. Brown, R. C. Bolton.

BRISTOL, TENN.—Davis-Sparger Auto Co.; capital, $50,000. Incorporators: C. C. Davis, S. C. Sparger, W. A. Sparger, G. L. Aronhime, Z. V. Sparger.

BUFFALO, N. Y.—Boltless Arch-Bar Truck Co., Inc.; capital, $50,000; to deal in car trucks, railroad equipment. Incorporators: R. S. Kent, F. C. Sle, P. Catalano.

CHICAGO, ILL.—Roseland Auto Sales Co.; capital, $10,000; to buy and sell automobiles. Incorporators: R. L. Ton, Victor A. Beckman.

CHICAGO, ILL.—Saxon Motor Co.; capital, $5,000; to manufacture motor vehicles, parts, accessories, etc. Incorporators: Thos. M. Whitson, Geo. Levy.

CHICAGO, ILL.—Shaw Motor Co.; capital, $1,500. Incorporators: Edward M. L. Ancona, Al. J. Pffaum, Edwin B. Mayor.

CHICAGO, ILL.—Gillson Motor Co.; capital, $15,000; to manufacture and deal in engines, motors, automobiles, etc. Incorporators: J. C. Fruit, E. D. Tillson, D. R. Hettelseter.

CHICAGO, ILL.—Klingelsmith Electric Truck Co.; capital, $350,000; to manufacture and deal in electrical vehicles. Incorporators: J. M. Klingelsmith, M. F. Cure, E. E. Tiley.

CHICAGO, ILL.—Shaw Motor Co.; capital, $100,000. Incorporators: James W. Shaw, August Easjubg, A. Meyer.

CLEVELAND, O.—M. Richard Automobile Co.; capital, $250,000; to manufacture a seven-passenger automobile.

CLEVELAND, O.—Mutual Auto Supply Co.; capital, $10,000; to deal in automobiles and all accessories. Incorporators: E. F. Strong, M. J. Roan, W. R. Ryan, Jr., J. W. Willdis, E. P. Smith.

CONNERSVILLE, IND. — Lexington-Howard Co.; capital, $150,000; to deal in automobiles. Incorporators: E. W. Ansted, G. W. Ansted, F. B. Ansted.

DOBBS FERRY, N. Y.—Matthews Sales Co.; capital, $1,000; to do a general automobile business. Incorporators: H. A. Matthews, H. E. Matthews, John McLaren.

DOVER, DEL.—Corsair Motor Co.; capital, $25,000; to manufacture motors and engines. Incorporators: J. M. Satterfield, W. P. Carrow, M. M. Hirons.

DOVER, DEL. — Corsair Motor Co.; capital, $25,000; to manufacture and deal in motor trucks and engines.

DOVER, DEL.—National Spoke & Nipple Co.; capital, $25,000; to manufacture and deal in motor vehicles and power boats.

EASTON, PA.—Midwout Motor Truck Mfg. Co.; capital, $500,000. Incorporator: E. C. Boyd.

EDDYVILLE, N. Y.—Ladlaw Co., Inc.; capital, $300,000; to deal in motors, etc. Incorporators: Clarence E. Eaton, L. H. Reed, Chas. L. Hepburn.

FORT WAYNE, IND.—H. G. Raymond & Co., capital, $20,000; to do a general automobile business. Incorporators: Chester G. Schiefer, William W. Bogart.

GREENVILLE, S. C.—Victor Automobile Co.; to manufacture automobiles. Incorporators: A. G. Dale, O. K. Mauldin, C. V. Stahl.

GROTON, CONN.—Mystic Motor Co.; capital, $2,000; to manufacture motors. Incorporators: J. D. Miller, H. P. Matthews, Geo. McDowell, H. M. Toxie.

HOUSTON, TEX.—Co-Operative Automobile Co.; capital, $5,000. Incorporators: John H. Cutten, F. E. Sweeney, M. S. Murray.

INDIANAPOLIS, IND.—Wizard Motor Co.; capital, $50,000; to manufacture and sell motors and motor vehicles. Incorporators: E. H. Hahig, O. C. Forbes, P. S. Florea.

JOHNSONVILE, N. Y.—Abbott-Atkin Co., Inc.; capital, $10,000; to manufacture, repair and deal in motor vehicles. Incorporators: Ernest H. Abbott, John Slade, Howard V. Atkin.

LOUISVILLE, KY.—Bywater-Ortner Motors Co.; capital, $12,000; to deal in motor cars and similar products. Incorporators: E. H. Ortner, Fannie Ortner, N. W. Bywater.

MCKEESPORT, PA.—Ninth Ave. Garage Co.; capital, $15,000; to deal in automobile and all accessories thereof.

MILWAUKEE, WIS.—Stanley Steamer Co.; capital, $15,000. Incorporators: J. C. Coxe, W. W. Burgett, F. S. Durham.

NEWARK, N. J.—C. J. Cross Front Drive Tractor Co.; capital, $100,000; to manufacture automobiles. Incorporators: C. J. Cross, J. W. Powelson, W. E. Holmwood.

PIQUA, O.—Meteor Motor Car Co.; capital, $50,000. Incorporators: W. K. Boal, S. Boal, C. W. Magee, J. T. Nielson, S. N. Arni.

PORT RICHMOND, N. Y.—Columbian Auto & Motor Car Co.; capital, $5,000. Incorporators: Jas. A. Wisely, Francis F. Leman, Earl T. Shortt.

SAN FRANCISCO, CAL.—Distillate Motor Equipment Co.; capital, $100,000; to deal in motor parts. Incorporators: H. M. McDonald, W. W. McDonald, G. S. Bartlett, A. R. Larn, W. Barnes.

SOUTH CHARLESTON, O.—Sullivan Automobile Co.; capital, $5,000; to deal in automobiles and supplies. Incorporators: F. J. Sullivan, F. B. Houston, C. Hornick, R. C. McMahon, Roger A. Houston.

SOUTH BEND, IND.—Coliseum Garage Co.; capital, $10,000; to engage in a general utility business, manufacturing automobile parts, repairing automobiles, and making and repairing gas and gasoline engines. Incorporators: John Walz, W. P. Furey, J. Elmer Peak.

ST. LOUIS, MO.—Mogul Motor Truck Co.; capital, $100,000. Incorporators: Geo. Griffith, P. R. Walsh, Julius Benninghaus.

ST. LOUIS, MO.—Electromobile Co.; capital, $100,000; to manufacture small trucks for indoor use. Incorporators: S. J. Bernheimer, Ralph Kalish.

TAMPA, FLA.—Haney Rescue Apparatus Co.; capital, $2,000,000; to manufacture automobiles, trucks, pumps and outside fire elevators.

TORONTO, ONT.—Royal Motor Supply Co., Ltd.; capital, $50,000.

WILMINGTON DEL.—Fifty-seventh Street Realty Co.; capital, $100,000; to manufacture and deal in automobiles and all appliances thereto.

GARAGES AND ACCESSORIES

BOSTON, MASS.—Milton Tire & Rubber Co.; capital, $40,000. Incorporators: P. L. Hardy, C. M. Riddock.

BROOKLYN, N. Y.—Oakland Garage Corp.; capital, $1,000. Incorporators: Herman C. Schaeffer, Estelle M. Schaeffer, Christopher Schaeffer.

CHICAGO, ILL.—Automobile Fender Equipment Co.; capital, $25,000; to manufacture and sell automobile fenders, accessories. Incorporators: Clarence M. Baldwin, Francis M. Suttle, Frank H. Towner.

CHICAGO, ILL.—Marshfield Auto Livery; capital, $10,000. Incorporators: Abe L. Salzman, Samuel C. Wood, Joseph Slottow.

CHICAGO, ILL.—Vulcalose Co.; capital, $2,400; to reclaim rubber scrap and manufacture finished products. Incorporators: Albert J. Mayer, Irving A. Mayer, Lee W. Frank.

CINCINNATI, O.—Neil-Smith Electric Tool Co.; capital, $30,000; to manufacture and deal in electric tools of all kinds. Incorporators: John W. Neil, Ed. F. Smith, Richard K. LeBlond, C. M. Bigger, James C. Neil.

CLEVELAND, O.—Noble Refining Co.; capital, $25,000; to engage in the refining of oils, and manufacture all kinds of greases and lubricants, including automobile oils and greases. Incorporators: L. A. Ritzman, C. L. Ficker, Frank Korella, L. E. Long, A. L. Ritzman.

DALLAS, TEX.—Quick Tire Service; capital, $10,000. Incorporators: H. L. Williford, K. B. Young, K. A. Ward.

DALLAS, TEX.—Pullman Tire Co.; capital, $5,000. Incorporators: R. S. Kayser, S. Zeve, S. W. Wexler.

DAYTON, O.—Stoddard-Dayton-Maxwell Repair Co.; capital, $10,000; to operate a repair shop. Incorporators: B. A. Rhodes, William I. Glasby, R. E. Gerspacher, L. A. Anderson, Horace Justice.

FORT WAYNE, IND.—Fort Wayne Auto Supply Co.; capital, $50,000. Incorporators: Jeremiah M. Cramer, John Allen Brewer, Harry H. Criswell.

GOLDSBORO, VA.—Ford Garage Co.; capital, $20,000. Incorporators: D. L. Edgerton.

INDIANAPOLIS, IND.—Ten Broeck Tyre Sales Co.; capital, $5,000; to sell and repair Ten Broeck tyres. Incorporators: R. T. Durrett, H. L. Lewman, H. P. Lewman.

INDIANAPOLIS, IND.—Ideal Accessory & Repair Co.; capital, $10,000; to deal in auto accessories. Incorporators: Arthur Wolf, W. F. Clemens, P. E. Powell.

LINCOLN, NEBR.—Giant Tire & Rubber Co.; capital, $20,000; to engage in automobile tire business. Incorporators: J. E. Fitzgerald, J. C. Root, R. W. Parker, John T. Yates, R. W. Morrison.

LYNN, MASS.—Broadway Garage, Inc.; capital, $1,000. Incorporators: Julian L. Swan, John C. Welsh, Geo. E. Crosby, Sarah E. Swan, William O. Swan.

MONTREAL, QUE.—Canadian Michelin Tire Co.; capital, $40,000; to deal in automobile tires.

NEW YORK, N. Y.—Boylston Garage, Inc.; capital, $900. Incorporators: Wm. H. Boylston, Geo. A. Boylston, Ed. S. Boylston.

NEW YORK, N. Y.—Double Tread Tire Co., capital, $1,000; to deal in tires, etc. Incorporators: James Martin, Gertrude Martin, Joseph Schwartz.

NEW YORK, N. Y.—Duplex Tire Co., capital, $1,000; tire repair shop. Incorporators: Joseph E. Finney, Gertrude Martin, James Martin.

NEW YORK, N. Y.—Helix Tube Co.; capital, $250,000; to manufacture automobile tires, tubes, etc. Incorporators: Geo. C. Howard, Clarence S. Houghton, James D. Gabler.

NEW YORK, N. Y.—Motor Car Spring Co., Inc.; capital, $75,000. Incorporators: Stephen Otter, Benj. Frankel, Joseph Prosky.

NEW YORK, N. Y.—Washington Auto Parts Co.; capital, $1,500. Incorporators: Joseph Dunn, M. Rosansky, Adolph Sachnoff.

NEW YORK CITY—Ajax Auto Service Co.; capital, $5,000. Incorporators: A. G. McKeever, J. J. Bradley, James P. Shinnick.

NEW YORK CITY—Bergman Bros., Inc.; capital, $2,000; to deal in automobile accessories. Incorporators: Harry Weinstein, Manuel Bergman, Theodore Bergman.

NEW YORK CITY—Delehanty Tire Corp.; capital, $125,000. Incorporators: W. E. Delehanty, N. M. Cooke, J. V. Reddy.

NEW YORK CITY—Diagonal Garage, Inc.; capital, $1,000. Incorporators: Jacob Schneider, Mary W. Schneider, Robert Burton.

NEW YORK CITY—Dinshah Engine Tester Corp.; capital, $50,000; to manufacture automobile engine testers, etc. Incorporators: Judson P. Welsh, P. M. Richards, D. P. Ghadiali.

NEW YORK CITY—McGraw Tire & Rubber Co.; capital, $1,000. Incorporators: Russell F. Hobron, William L. Levy, Maxwell Davidson.

NEW YORK CITY—North Moore Garage, Inc.; capital, $2,500. Incorporators: Max Schlesinger, Allen Fox, Edward Fox.

NEW YORK CITY—Wagner Sales Corp.; capital, $5,000; to deal in self-starters and other devices for automobiles. Incorporators: Moses Morris, Jos. G. Eichenbaum, Albert F. Wagner.

POUGHKEEPSIE, N. Y.—Horace Sague & Son; capital, $35,000; to operate a general garage and deal in autos and supplies. Incorporators: H. Sague, J. E. Sague, C. Sague.

RACINE, WIS.—Shepard Plating Works; capital $5,000; to do a general plating and metal business. Incorporators: William H. Shephard, Peter Ruetz, Fulton Thompson.

RAHWAY, N. J.—Nation Body Co.; capital, $10,000; to deal in and manufacture automobile bodies. Incorporators: Henry A. Grube, Frank P. Gallagher, Adam Schweitzer.

SEA CLIFF, N. Y.—Senrab Carbureter Co.; capital, $25,000. Incorporators: L. I. Barnes, E. H. Madison, T. H. Hogeman, Jr.

ST. LOUIS, MO.—St. Louis Pneumatic Valve Co.; capital, $30,000; to manufacture pneumatic valves.

SYRACUSE, N. Y.—Elasto Co., Inc.; capital, $30,000; to manufacture tire filler. Incorporators: John G. Ellendt, Albert T. Bradley, Henry G. Kennedy.

TORONTO, ONT.—Columb Tyres Import Co.; capital, $50,000; to deal in tires.

TRENTON, N. J.—Central Garage Co.; capital, $50,000. Incorporators: Oliver O. Moore, Albia W. Stryker.

WACO, TEX.—United Auto Supply Co.; capital, $5,000; to deal in automobile accessories. Incorporators: R. S. Kayser, S. Zeve, S. W. Wexler.

WATKINS, N. Y. — Watkins Garage; capital, $35,000. Incorporators: Geo. S. Hice, Newton J. Baxter, W. Gail Royce.

CHANGES OF NAMES AND CAPITAL

CANTON, O.—Timken-Detroit Axle Co.; decrease of capital from $1,000,000 to $942,500.

CLEVELAND, O.—Lozier Sales Co., of Cleveland; change of name to Cuyahoga Sales Co.

INDIANAPOLIS, IND.—G & J Tire Co.; capital increased from $1,000,000 to $2,000,000.

KANSAS CITY, MO.—Inter-State Auto & Supply Co.; change of name to Missouri-Kansas Auto & Supply Co.

LEXINGTON, KY.—Commercial Auto Co.; capital increased from $5,000 to $12,000.

LOUISVILLE, KY.—W. P. Smith Auto Repair Co.; capital reduced from $10,000 to $5,000.

SPRINGFIELD, O.—Kelly Motor Truck Co.; capital decreased from $500,000 to $5,000.

TOLEDO, O.—Electric Auto Lite Co.; capital increased from $100,000 to $225,000.

VANCOUVER, B. C.—The Tire Shop; change of name to E. W. Starke Co.

Second Train Load of Maxwells for the South in One Week

"**Another trainload for Dixie,** and the second in a week," announced Sales Manager Redden, as he jubilantly waved a telegram he had received from "Bunny" Burwell of Charlotte, N. C. "An even hundred Model '25's,' 24 '35's' and 6 Maxwell '50-6's' at one wallop—that's some order," said sales manager, "and they call this hard times.

"**Herbert N. Casson,** in a recent address, said, 'The North is acquiring sentiment and the South is getting rich.'

"**This second trainload** order in a week certainly bears out half of his statement—that the South is getting rich.

"**Of course the South** always did have sentiment and romance, but it is only of late that automobiles have been going in large quantities south of Mason and Dixon line.

"**Maxwell cars** have always been popular in the South, and yet it came somewhat as a surprise to me when, at a recent little luncheon given his dealers by Charles Booth, our District Manager at Atlanta, one of the dealers got up, and with a few 'well chosen words,' handed me an order for a trainload of Maxwells, to be shipped forthwith.

"**Needless to say,** I was speechless, as befits such an occasion, but I did manage to gasp, 'accepted, and will be shipped immediately.' That trainload consisting of 44 big 50-ft. freight cars, arrived in Atlanta Monday morning. The dealers were there waiting for them, and they disappeared so rapidly—a car load here, four car loads there, two to another point, that Booth wired me the following day, 'how soon can Atlanta have another trainload?'

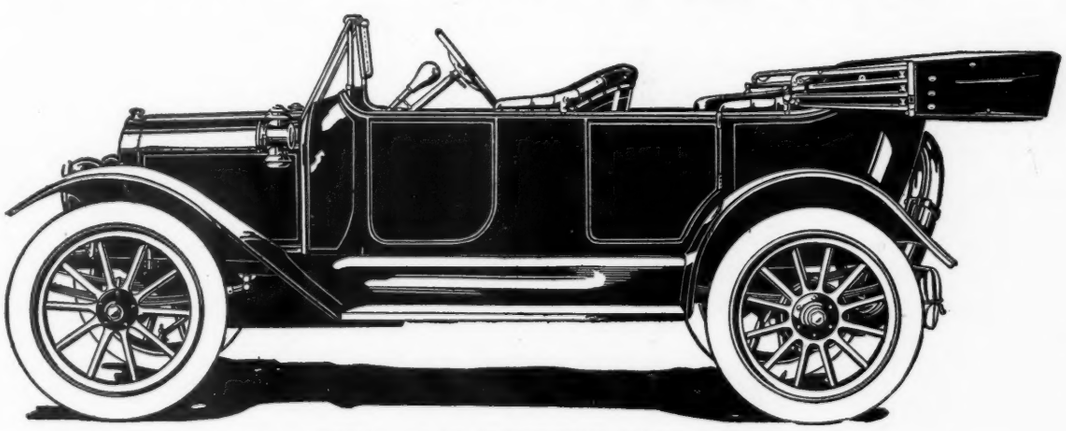
"**'Bunny' Burwell,** who is one of the most successful dealers in the Carolinas, heard about the Atlanta trainload, and fearing there would not be enough left to go around, took the first train North, so as to personally conduct the order to the factory.

"**Of course the weather** favors them in the South, but while we are talking about hard times (let's see, was that what we were talking about?), let's not forget Minneapolis, which is enjoying the extreme degree of cold, yet has maintained its supremacy over all other points. C. R. Newby, Maxwell District Manager at Minneapolis, has continued to take more than his quota of cars all winter—in fact he leads the bunch."

Continuing, the sales manager said in ministerial tones, "and what moral may we draw from this, my brethren?"

"**The moral** is, that neither cold nor stringency of the money market can stop a good car.

"All's Well with the Maxwell"



THE "25-4" TOURING CAR—$750

MAXWELL MOTOR COMPANY, Inc.

DETROIT, MICH.

Dealers and Service Everywhere

New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Amsterdam, N. Y.	Jeffery	W. H. Bell
Arkansas City, Kans.	Moon	J. E. Sutton
Ashland, Ala.	Jeffery	W. A. Kitchens
Atkinson, Neb.	Oakland	C. E. Havens
Auckland, N. Z.	Moon	Strong & Trowbridge
Aurelia, Ia.	Maxwell	Johnson Bros.
Bancroft, Neb.	Oakland	Alvin Browning
Batavia, Ill.	Oakland	Roy Foster.
Beatrice, Neb.	Oakland	G. O. Rains & Co.
Bellevue, Mich.	Maxwell	Legge & Simons
Beloit, Kans.	Jeffery	Ed. James
Beresford, S. D.	Maxwell	P. A. Rasmussen & Co.
Bloomington, Ill.	Oakland	Thos. E. Stewart.
Boston, Mass.	Velie	F. L. Roberts Co.
Boswell, Pa.	Oakland	Boswell Auto Co.
Brawley, Cal.	Oakland	Bryden & Shank.
Bridgeport, Conn.	Maxwell	Case Motor Co.
Bryan, O.	Oakland	Wertz & Wertz
Buda, Ill.	Moon	Holmes & Anderson
Burlington, Kan.	Oakland	Vesta Harreld.
Canal Winchester, O.	Empire	Glen C. Coffman
Cannon Falls, Minn.	Oakland	John J. Anderson.
Canton, O.	Oakland	Monnot & Sacher
Canyon, Tex.	Moon	J. A. Guthrie & Co.
Centerburg, O.	Maxwell	E. E. McGuire
Central City, Neb.	Oakland	Central City Implement Co.
Centralia, Wash.	Maxwell	Centralia Garage.
Champaign, Ill.	Maxwell	Otto O. Harris
Charles City, Ia.	Oakland	O'Harrow Auto Co.
Charlotte, Mich.	Oakland	J. W. McCormack
Clarksville, O.	Oakland	Clarksville Motor Car Co.
Clyde, O.	Maxwell	W. A. Raush & Son.
Coleridge, Neb.	Oakland	H. V. Coonrod
Colton, Cal.	Maxwell	J. Z. Adamson.
Columbia City, Ind.	Jeffery	F. F. Morsches
Columbus, O.	Imp	Mercer Motor Car Co.
Covina, Cal.	Maxwell	C. R. Young.
Covina, Cal.	Oakland	C. H. Coffman.
Crawford, Neb.	Oakland	Scott Auto Co.
Cresco, Ia.	Oakland	Wentworth & Burr.
Crystal Lake, Ill.	Oakland	Wm. Meyer.
Danneborg, Neb.	Oakland	Oscar Carlson
Delaware, O.	Empire	H. W. Lenox
Des Moines, Ia.	Meteor	J. E. Robison
Detroit, Mich.	Jeffery	W. H. Weber
Dixon, Ill.	Maxwell	J. E. Miller
Dixon, Ky.	Hudson	R. L. Jackson
East Lynn, Ill.	Jeffery	J. P. McCord
Eau Claire, Mich.	Oakland	Eau Claire Garage
Earlville, Ia.	Jeffery	P. M. Cloud
Edison, O.	Empire	C. W. Wells
Elmwood, Wis.	Maxwell	Elmwood Auto Co.
Fairfax, S. D.	Oakland	J. E. Beagle
Fillmore, Cal.	Oakland	Opsahl Bros.
Frankfort, Ky.	Hudson	Joseph Severence
Frankfort, N. Y.	Oakland	H. M. Smith & Son
Franklin, Mass.	Oakland	John Stobbart
Fresno, Cal.	Hudson	Evans-Cobb Co.
Fort Scott, Kans.	Jeffery	Ft. Scott Grain & Imp Co.
Georgetown, Tex.	Oakland	Towns Bros.
Glens Falls, N. Y.	Jeffery	Glens Falls Auto Co.
Gooding, Idaho	Maxwell	Furcht Auto Co.
Goodland, Ind.	Oakland	Oakland Sales Co.
Gray, Ia.	Oakland	King & Shaw
Greenleaf, Kan.	Jeffery	Wm. Kennington
Hartford, Conn.	Metz	W. N. Barrett
Hartford, Conn.	Oakland	Britton Co.
Hartington, Neb.	Oakland	Hans J. Sorenson
Harvard, Neb.	Oakland	Schwenk & Bieck
Hatboro, Pa.	Maxwell	Chas. H. Yerkes
Havana, N. D.	Maxwell	J. H. Anderson
Haverhill, Mass.	Oakland	Central Garage
Henderson, Tex.	Franklin	Crow Bros.
Henry, Ill.	Moon	J. E. Barry & Co.
Hickory, Pa.	Moon	Ross Motor Car Co.
Hicksville, O.	Oakland	Good & Kimbel
Hillsdale, Mich.	Jeffery	Pinkham & Wright
Humphrey, Neb.	Oakland	H. J. Brening
Huntsville, Ala.	Moon	O. H. Graham
Inman, Neb.	Oakland	Inman Imp. & Hardware Co.
Ishpeming, Mich.	Oakland	J. C. Forell
Kingsley, Ia.	Maxwell	O. S. Pixler
Kittanning, Pa.	Moon	Moorhead Motor Car Co.
Lawrence, Kans.	Moon	E. L. Charlton
Leetsdale, Pa.	Moon	F. H. Mohn
Leipsic, O.	Jeffery	H. H. Townsend
Leland, Ill.	Jeffery	Jonas Sawyer
Lesterville, S. D.	Maxwell	A. O. Wagner.
Lexington, Mo.	Moon	E. F. Cox
Lexington, Neb.	Oakland	O. K. Jones
Liberty, Mo.	Jeffery	R. A. Davidson
Logan, O.	Studebaker	Studebaker Garage
Long Pine, Neb.	Oakland	Ed. C. Engle
Loup City, Neb.	Oakland	A. G. Ogle
Louisville, Ky.	Winton	Thomas Garage
Lyndonville, N. Y.	Oakland	Kenyon & Ridleman
Madison, Minn.	Oakland	B. Bolland.
Manchester, Ia.	Oakland	Strickland & Strickland
Manteno, Ill.	Jeffery	O. C. Schreffler.
Marietta, O.	Jeffery	Marietta Motor Car Co.
Marion, Ill.	Hupmobile	Arch Borum.
Marion, O.	Imp	Ohls Decorating Co.
Marsardis, Me.	Oakland	E. J. Matthews
Mart, Tex.	Oakland	Jaughn & Garner.
McDonald, Pa.	Oakland	McDonald Auto Co.
McKeesport, Pa.	Moon	J. T. Mooney & Son
Mercer, Pa.	Moon	Mercer Auto Co.
Mexia, Tex.	Oakland	V. Wolverton & Co.
Milford, Ia.	Franklin	Munson Bros.
Milford, O.	Oakland	Milford Motor Co.
Minneapolis, Minn.	Crow-Elkhart	Alex. R. Curtis
Minneapolis, Minn.	Motokart	C. & S. Motor Car Co.
Mobile, Ala.	Moon	A. W. Brooks
Monnessen, Pa.	Moon	Monnessen Plumbing Co.
Montreal, Que.	Brockville Atlas	H. W. Spencer & Co.
Montreal, Que.	Peerless	Motor Transport Co.
Montreal, Que.	Simplex	Prim & Co.
Morgantown, W. V.	Jeffery	City Auto Co.
Monroe, N. Y.	Maxwell	Central Garage.
Mount Clemens, Mich.	Oakland	John Essig
Napa, Cal.	Maxwell	E. J. Knox
Nashville, Tenn.	Moon	John H. Lawrence & Sons
Negaumee, Mich.	Oakland	J. J. Wentla
Newark, O.	Empire	Murray Connolly
Newark, O.	Oakland	American Machine Co.
Newark, O.	Studebaker	S. E. Forsythe
Norfolk, Va.	Jeffery	Allen Motor Co.
North Adams, Mass.	Oakland	F. L. Rand Auto Co.
Norwich, N. Y.	Jeffery	L. A. Cevasco
Oakdale, Neb.	Oakland	H. L. Ingalsbe
Oakland, Cal.	Maxwell	C. R. Allen
Oakland, Ia.	Oakland	F. W. Pierce
Odell, Ill.	Moon	Cosgrove & Cleary
Ogdensburg, N. Y.	Jeffery	Percy W. Dawley
Olathe, Kans.	Moon	H. A. Case Auto Co.
Owensboro, Ky.	Hudson	Elmer Little
Oxford, Mich.	Maxwell	D. L. Bronson
Pacific Grove, Cal.	Maxwell	Culp Bros.
Paducah, Ky.	Hudson	Kentucky Auto & Mach. Co.
Paducah, Ky.	Oakland	E. Guthrie Co.
Palestine, Tex.	Oakland	John Ormond.
Palmyra, Ill.	Maxwell	Bell Hart Tool Co.
Paulding, O.	Oakland	Paulding Auto Co.
Philadelphia, Pa.	Partin Palmer	Colonial Motor Co.
Phoenix, Ariz.	Maxwell	Geo. D. Gates.
Pittsfield, Mass.	Franklin	Pittsfield Carriage Co.
Pittsfield, Mass.	Oakland	Fred Smith
Plainfield, Ill.	Oakland	C. M. Reeves & Son.
Platte, S. D.	Oakland	Chas. S. Just
Port Angeles, Wash.	Maxwell	E. F. Stoner.
Portage, Wis.	Franklin	Franklin Motor Car Co.
Postville, Ia.	Oakland	H. J. Shutte.
Prairie Du Chien, Wis.	Maxwell	John I. Keller
Punxautawney, Pa.	Oakland	P. L. Brown
Ravenna, Neb.	Oakland	Louis Vesely
Rockland, Me.	Oakland	Rockland Auto Sales Co.
Romeo, Mich.	Maxwell	H. L. Turner
Russiaville, Ind.	Oakland	Eikenberry Bros.
Sandusky, N. Y.	Maxwell	W. J. Joslyn
San Francisco, Cal.	National	Rene J. Marx
Santa Cruz, Cal.	Maxwell	C. M. Bias
Santa Rosa, Cal.	Maxwell	J. P. Muenzer
Sargent, Neb.	Oakland	David T. Adams
Saskatoon, Sask.	Franklin	Franklin Automobile Dealers
Sherbrooke, Que.	Cole	Sherbrooke Motor Car Co.
Sherbrooke, Que.	Hudson	J. F. O'Donnell
Smithland, Ia.	Maxwell	L. N. Gambs
Somerville, Mass.	Economy	A. G. Norton
Spirit Lake, Ia.	Maxwell	Hartman & Hurd
Springfield, Neb.	Oakland	Johnson & Armstrong
Springwater, N. Y.	Maxwell	E. W. Doolittle.
Stacyville, Ia.	Oakland	Gerbig & Smith.
Stapleton, N. Y.	Maxwell	Louis Blum
Sterling, Ill.	Maxwell	Sterling Garage
Suncook, N. H.	Oakland	Hillman's Garage
Sunny Mill, Ill.	Maxwell	Arthur Lawson Co.
Sutton, Neb.	Oakland	J. Bender & Son
Tabor, S. D.	Oakland	Taber Motor Car Co.
Tacoma, Wash.	Metz	Cliffe Heath Machine Co.
Topeka, Kans.	Moon	Richmond Auto Co.
Tyndall, S. D.	Oakland	Robinson Auto Co.
Valley, Neb.	Oakland	Geo. Cowles
Vande Grift, Pa.	Moon	Whitacre & McCullough
Waterman, Ill.	Maxwell	Kit Carson
Watsonville, Cal.	Maxwell	Century Garage
Waverly, Ill.	Maxwell	T. S. Harris
Westfield, Ia.	Maxwell	T. J. Martin
Weston, Mo.	Jeffery	Weston Auto Co.
Wharton, O.	Maxwell	T. J. Howard
Wheeling, W. Va.	Jeffery	H. M. Bratton
White Lake, S. D.	Oakland	W. B. Huebl
Wichita, Kan.	Moon	H. W. Schroeter
Willimantic, Conn.	Oakland	F. L. Powell
Woodstock, Ill.	Maxwell	Woodstock Implement Co.
Worthington, Minn.	Jeffery	Dr. J. T. Smallwood

ELECTRIC VEHICLES

Vancouver, B. C.	Ohio	Harold C. Mors

COMMERCIAL VEHICLES

Boston, Mass.	Velie	F. L. Roberts Co.